SPORT FISHERIES IN THE CANADIAN PORTION OF LAKE ERIE AND CONNECTING WATERS, 1948-1980

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Ontario Ministry of Natural Resources
Fisheries Branch, Queen's Park
Toronto, Ontario, M7A 1W3

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L. Kazimierz Sztramko
Ontario Ministry of Natural Resources
Lake Erie Fisheries Assessment Unit
R.R. #2, Wheatley, Ontario, N0P 2P0

And

J.R. Paine
Ontario Ministry of Natural Resources
Lake Erie Fisheries Assessment Unit
R.R. #2, Wheatley, Ontario, N0P 2P0

K.H. Loftus, Editor

Ontario
Ministry of Natural Resources
Hon. Alan W. Pope
Minister
John R. Sloan
Deputy Minister

TABLE OF CONTENTS

	Page
Abstract	iii
Introduction	1
Descriptions of Study Areas	1
Lower Detroit River	1
Western Lake Erie	1
Rondeau Bay	2
Long Point Bay	2
Eastern Lake Erie	2
Upper Niagara Area	2
Review of Survey Methods	2
Summer Boat Fisheries	2
Winter Ice Fisheries	4
Summer Shoreline Fisheries	4
Spring Rainbow Smelt Fishery	4
Trends in Selected Fisheries	5
Summer Boat Fisheries	5
Upper Niagara River	5
Eastern Lake Erie	5
Long Point Bay	5
Rondeau Bay	6
Western Lake Erie	6
Lower Detroit River	6
Winter Ice Fisheries	7
Upper Niagara River	7
Eastern Lake Erie	7
Long Point Bay	7
Rondeau Bay	7
Western Lake Erie	7
Lower Detroit River	7
Miscellaneous	7
Northern Pike Spear Fishery	7
Rainbow Smelt Fishery	8
Characteristics of the Lakewide Fishery	8
Acknowledgements	8
Bibliography	8
Personal Communications	11
Tables	12
Figures	39
Appendix	43
Appendix A. Derivation of Lakewide Comparison Data	43

ABSTRACT

Sztramko, L.K., and J.R. Paine. 1984. Sport fisheries in the Canadian portion of Lake Erie and connecting waters, 1948-1980. Ont. Fish. Tech. Rep. Ser. No. 13: iii & 43p.

The Ontario Ministry of Natural Resources' Lake Erie sport fishery data, collected from 1948-1980, are assembled in a compendium to enable managers to set priorities for individual fisheries and, where possible, to view their status quo within the context of a longer period.

The waters of Lake Erie were characterized by diverse angling opportunities, and the fisheries for smallmouth bass (*Micropterus dolomieui*) in Long Point Bay and walleye (*Stizostedion vitreum vitreum*) in the western basin ranked among the best in North America. Since 1975, known annual angling effort has been estimated at 1.2 million angler-h (260,000 angler-d). Fifty-four percent (54%) of annual effort was expended in the summer-boat fishery; of this, 42% occurred in Long Point Bay. Of the estimated annual harvest of 1,028,000 fish (excluding rainbow smelt, *Osmerus mordax*), 64% was yellow perch (*Perca flavescens*), 11% was white bass (*Morone chrysops*), 8% was walleye, and 6% was smallmouth bass.

Significantly lower (P 0.01) angler success rates for smallmouth bass in Long Point Bay since 1968 were linked to the discontinuation of a sanctuary regulation designed to protect spawning bass. Success rates for bluegill (*Lepomis macrochirus*) and crappie (*Pomoxis* spp.), and total angling effort in the summer-boat fishery, have declined at Rondeau Bay since 1977. The decline in angling effort for this fishery may have been a result of the decline in success rates for bluegill and crappie and/or the unfavourable economic conditions in the United States, from where most anglers originalted. In 1979 and 1980, mean length-at-age of two-year-old walleye, in the Detroit River and in the western basin, declined from previous years. This may have been a density-dependent response induced by the presence of a very strong 1977 year-class.

Keywords: Sport fisheries, Canadian, Lake Erie, connecting waters, 1948-1980.

SPORT FISHERIES IN THE CANADIAN PORTION OF LAKE ERIE AND CONNECTING WATERS, 1948-1980

INTRODUCTION

The purpose of this report is to consolidate the data collected by the Ontario Ministry of Natural Resources on the Lake Erie sport fisheries from 1948 to 1980. This compendium will allow both fisheries managers and sport fishermen to view the present-day fisheries within the context of a 33-year period.

The Ontario Ministry of Natural Resources (formerly the Department of Lands and Forests) has monitored selected sport fisheries of Lake Erie and its connecting waters since 1948. The number of years that surveys were conducted on various fisheries appears to be related to the magnitude of the fisheries. For example, the data series available for the Long Point Bay area, the largest sport fishery in Lake Erie, is more complete than the data series for any other sport fishery on the lake. The results of the monitoring activities generally were documented as file or manuscript reports having limited circulation; however, some survey results were included as a component of annual reports prepared by administrative districts within the Ministry.

The objectives and methods of individual surveys have varied through time. Earlier surveys generally were qualitative in nature, providing information on the variety of species captured and the angler success rates for those species. In response to increased demand for information relating to sport fisheries, survey methods later evolved to include quantitative estimates of catch and effort, as well as the qualitative information provided by earlier works.

Interpretations of sport fishery data for the last 33 years should only be made with an understanding of the dynamic character of the Lake Erie ecosystem, and the changes which have occurred. A variety of cultural stresses have altered the fish community and habitat of Lake Erie over the last 150 years: erosion, nutrient loading, invading species, stream degradation, shoreline restructuring, drainage of wetlands and toxic pollutants. The result is a lakewide fish community dominated by yellow perch (*Perca flavescens*), white bass (*Morone chrysops*), channel catfish (*Ictalurus punctatus*), freshwater drum (*Aplodinotus grunniens*), carp (*Cyprinus carpio*), goldfish (*Carassius auratus*), and rainbow smelt (*Osmerus mordax*) (Regier and Hartman 1973, Leach and Nepszy 1976, Thompson 1978).

Lake Erie's fish community is best described as being diverse. Coldwater, mesothermal and warmwater species inhabit this Great Lake and are represented by 138 of the 177 freshwater species found in Canada (Leach and Nepszy 1976). The fish are distributed in three distinct basins, each with unique limnological characteristics (Hartman 1972).

Walleye (*Stizostedion vitreum vitreum*) showed a marked increase in abundance in western Lake Erie during the 1970's. The commercial fishery for this species was closed in western Lake Erie in 1970, due to mercury contamination, then re-opened in 1976. Since that time it has been controlled by means of quota management. Lake trout (*Salvelinus namaycush*), considered extinct in Lake Erie (Hartman 1972), have been re-introduced by the states of New York and Pennsylvania with the intent of establishing a naturally-reproducing population in the eastern basin. Coho salmon (*Oncorhynchus kisutch*), planted annually since 1968 by various states fronting Lake Erie (Leach and Nepszy 1976), have become common in Canadian waters of the lake; however, the continued presence of this species is believed to be dependent on stocking. Pink salmon (*Oncorhynchus gorbuscha*) appeared in the lake's commercial fishery in the late 1970's, and a number have been observed in streams in the Long Point Bay area at spawning time. It is believed that this species immigrated to Lake Erie from the Upper Great Lakes after being introduced in Lake Superior in 1956 (Wagner and Stauffer 1980). The ability of pink salmon to successfully reproduce in tributary streams of Lake Erie is unknown. Nevertheless, their continued presence in Lake Erie appears likely, either as a result of natural reproduction or emigration.

DESCRIPTIONS OF STUDY AREAS

The locations of the principal sport fishing areas of Lake Erie are shown in Figure 1. With few exception, detailed descriptions of study areas prior to 1975 are unavailable. Methods and areal definitions employed in surveys since 1975 are described in the individual reports. A brief description of the study areas in the major summer boat fisheries since 1975 is provided below.

LOWER DETROIT RIVER

The lower Detroit River study area comprised a 21-km section of the river, from the northern tip of Fighting Island south to Bar Point. The study area boundaries (Witzel 1981b) were:

north - latitude 42°15'N
south - a line proceeding southwest from Bar Point to the point of intersection of the international boundary and latitude 42°02'30"N
east - the east bank of the river
west - the international boundary

WESTERN LAKE ERIE

Western Lake Erie studies focused on the waters to the west of Pelee Island, viz., East Sister, North Harbour, Hen and Chicken Islands

(Sector I) and Pelee Island (Sector II). Study area boundaries (Sztramko 1979a) were:

Sector I - north - the upbound shipping lane
south - the international boundary
east - longitude 82°44'W
west - the international boundary

Sector II- north - the upbound shipping lane
south - the international boundary
east - longitude 82°30'W
west - longitude 82°44'W

The study area comprised an irregularly-shaped tract with a maximum east-west distance of 45 km and a maximum north-south distance of 21 km.

RONDEAU BAY

The Rondeau Bay study area (42°17'30"N, 81°53'30"W) was a 2700-ha bay area approximately 7 km southeast of the Town of Blenheim (Witzel 1981c).

LONG POINT BAY

The Long Point Bay study area (42°37'N, 80°10'W) comprised 17,797 ha (Olsen 1980) near the north shore of Lake Erie.

EASTERN LAKE ERIE

The eastern Lake Erie study area extended from a point on the north shore of Lake Erie, approximately 11 km west of Port Maitland, to the Peace Bridge at the mouth of the Niagara River. The major fishery in these waters was Gravelly Bay, a 200-ha bay adjacent to the City of Port Colborne (42°52'N, 79°16'W) (Lewies and Dimond 1982).

UPPER NIAGARA RIVER

The upper Niagara River area (43°16'N, 79°03'W) extended from the International Railway Bridge north to Motor Island in the Tonawanda Channel and Black Creek in the Chippawa Channel (1012 ha) (Lewies and Dimond 1982).

REVIEW OF SURVEY METHODS

Over the years, sport fishery surveys have evolved from unstructured, good-weather surveys to ones designed to produce statistically reliable information. The move toward more effective sampling advanced in 1975 with the involvement of the newly established Lake Erie Fisheries Assessment Unit. Sampling designs incorporated stratification and replication within strata, with the aim of minimizing statistical biases and increasing precision of estimated parameters. Therefore, catch-effort data collected and analyzed prior to 1975 should be regarded with caution, particularly when comparing them to more recent data.

The following sections briefly outline and evaluate the survey methods employed in the major sport fisheries.

SUMMER BOAT FISHERIES

The first known survey on Lake Erie was conducted in Long Point Bay in 1948 by J.M. Ramsay, probably in response to reports of smallmouth bass (*Micropterus dolomieui*) kills prior to opening day (Berst 1951). Creel censuses in this bay were resumed in 1951. Generally, they were conducted by conservation officers during the course of their daily enforcement activities (Lands & Forests 1952): however, sometimes a conservation officer was assisted by a person who obtained complete trip information from dockside. Surveys were not pre-scheduled, and they were secondary to enforcement activities. This type of survey was conducted sporadically at different locations in the district through 1958.

In 1959, Roseborough (1960) incorporated angler counts and boat counts into the creel survey design to obtain estimates of total angling pressure[1] and total harvest. During that year, a 16-week period (June 1 to September 20) was set aside for sampling. Sampling was conducted four times, over the 16-week period, on each day of the week. This resulted in a sampling intensity of 25% of all days. Daily sampling periods were 8 h long with 4 h set aside for boat counts and 4 h for interviews. The total number of boats counted during a 4-hour period was considered to represent one-half of the total number present in a 16-h fishing day (0600-2200 h). Effectively, the boat count conducted during the 4-h count was 'instantaneous' and not an estimate of the total number of boats which used the area during the 8-h sampling period. To be considered an accurate estimate of the total number of boats present, it would have to be assumed that at the

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[1] Angler-hours and rod-hours have been used as measures of angling pressure on Lake Erie. Rod-hours was introduced in 1974 to more accurately measure angling pressure as it incorporated the elements directly related to the capture of fish, viz., time actively spent fishing and the number of rods-in-use.

During the 1974-1980 period, angler-hours, which may have been more appropriately termed "user-hours", was used as a measure of participation in the fishery. Angler-hours was derived from the time which a fishing party actively fished and the number of persons in the party, regardless of whether all individuals in the party fished. The precise definition of angler-hours for the 1948-1973 period is not known, but it is assumed that only those persons in a party which actually fished were included.

Angler-hours as a measure of participation, and rod-hours as a measure of angling pressure used in derivation of catch indices, agreed within ±5% for the summer boat fisheries during the 1974-1980 period.

moment the count was conducted, all the boats that would fish during that period had arrived together and that the rates of immigration and emigration were zero. Biased estimates could arise due to the dynamics of immigration/emigration of boats, as well as the fact that the conservation officers were not instructed to vary the times of their boat counts.

The total catch was derived by doubling the catch recorded by the census takers during a sampling period, assuming that the average angler was interviewed at the mid-point of his fishing trip.

Lastly, total numbers of anglers and harvest could be over-estimated by 10-30% as the expansion failed to consider weathered-out days. If a scheduled date was missed due to bad weather, census crews were instructed to schedule another in its place.

In 1960, Roseborough introduced stratification by day-type into the creel census design (Roseborough 1960). Estimates of harvest and total anglers were derived independently for weekend days and weekdays. Furthermore, greater emphasis was placed on weekend days, and the creel was scheduled so that 16.5% of all weekdays and 33.3% of all weekend days were surveyed. This resulted in a sampling intensity of 21% of all possible days during the creel census scheduled between June 20 and September 11, inclusive.

Roseborough also utilized a method of estimating the total number of boats present in any given 16-h fishing day, based on the actual count in a given 4-h boat count period. The daily estimated total number of boats was derived by multiplying the proportion of newcomers in a 4-h period, (i.e., those boats that had not fished in the previous 4-h period) by the actual number of boats counted in that same period, and then summing these products for all four 4-h periods.

While the rationale for providing estimates on any given day was sound, the expected relationship between the actual boat counts per 4-h period and the estimated daily total might be weakened by seasonal effects. It was based on actual data obtained from individual 4-h time periods (0600-1000 h; 1000-1400 h; 1400-1800 h; 1800-2200 h), only one of which was sampled per scheduled day through the 12-week study period. Eight weekend days and ten weekdays were sampled through the sampling period. The expected relationship between observed and estimated values would be valid if angling effort was distributed homogeneously through the sampling period; however, it is generally known that angling effort, in fisheries such as Long Point Bay, is substantially greater on opening day and the first part of the season than during the rest of the season. Furthermore, it would have to be assumed that the proportion of daily effort in any given 4-h period would remain constant through the fishing season. This assumption was not tested.

As in 1959, the 1960 sampling design failed to consider weathered-out days in the expansions. Consequently, estimates of effort and harvest could have been overestimated by as much as 10-30%.

From 1961 to 1964, inclusive, creel census methods and associated limitations were assumed to be similar to those of 1960. Exceptions included the reduction of the survey period to 10 weeks in 1963 (June 22 to September 1) and expansion of the survey period to 11 weeks in 1964 (June 27 to September 13).

Creel census methods from 1965 to 1971 were assumed to be similar to those of 1960, with the following exceptions:

1) During 1965 and 1966, sampling intensity on Long Point Bay, and presumably other areas of Lake Erie, was carried out mainly on weekends (15 of 19 sampling days in 1965; 22 of 27 days in 1966); in 1967, sampling intensity was evenly distributed.

2) Boat counts (angler counts) for the purpose of estimating total effort were not conducted during this period, except in 1967.

On April 1, 1972, the Ontario Department of Lands and Forests officially became the Ontario Ministry of Natural Resources. From then until about 1980, reorganization of the new Ministry resulted in the decentralization of the former Lake Erie District, headquartered at Aylmer, into four smaller areas with district offices at Fonthill, Simcoe, Aylmer, and Chatham. In addition, the Lake Erie Fisheries Assessment Unit (LEFAU) was formed in 1974.

In 1975, the LEFAU developed and implemented a standardized creel census design to be used in the western Lake Erie and Detroit River surveys. (The Rondeau Bay survey did not become a LEFAU programme until 1977.) General design concepts were patterned after Olver's (1970). Lincoln (1975) subsequently applied those concepts to a survey of western Lake Erie. Characterized as a roving on-water census, it incorporated the statistical concepts of pre-scheduling (sampling dates were chosen systematically), stratification (to reduce variation about the overall estimates) and replication (to determine the precision of the estimates). A computer program to facilitate the processing of creel data (Petzold 1980) was developed and implemented in 1977. From 1978 through 1980, the LEFAU was involved in cooperative creel census programmes with the Niagara District (Eastern Lake Erie/Niagara River) and Simcoe District (Long Point Bay). The intent of these joint ventures was to produce statistically-reliable data as per the concepts outlined above.

Prior to the involvement of the LEFAU, Long Point Bay was surveyed by both the Nanticoke Fish Study and the Simcoe District in 1972 and 1973, and then only by the Nanticoke Fish Study (from 1974 to 1977). It was not possible to estimate total angling effort during this time because

either pressure counts were not conducted (1972-74) or they were of questionable accuracy and could not be used (1975-77). Furthermore, survey areal definitions varied during this period because they were not standardized until 1976 (Reid 1977a).

WINTER ICE FISHERIES

The first known winter creel census survey on this Great Lake was conducted in eastern Lake Erie in 1958. Thereafter, surveys were executed on an annual basis in Long Point Bay, and on a sporadic basis in the other Lake Erie fisheries. Although documentation of winter creel census methods for the 1950-71 period generally is sparse, or non-existent, general design concepts were probably similar to summer creel surveys because responsibility for both usually rested with the same individuals.

A notable difference between the winter and summer surveys is that winter angling effort was reported in total numbers of anglers, rather than angler-hours. For trend analyses, estimates of total effort in angler-hours were calculated by dividing the estimated total harvest of all species (in numbers of fish kept) by the seasonal catch per unit of effort for all species.

Only Long Point Bay was surveyed from 1972 through 1979. (Winter surveys on Rondeau Bay began in 1980.) In 1972 and 1973, the Long Point Bay winter creel census was conducted by the Simcoe District of the Ontario Ministry of Natural Resources. Only catch per unit of effort was recorded. The Nanticoke Fish Study (Hamley et al., in prep.) executed the winter creel from 1974 to 1979, and gathered additional information such as catch, effort, and numbers of anglers. Whether anglers were fishing inside or outside of huts was also noted. Uncensused huts were counted in 1976, 1978, and 1979.

An important limitation of the Long Point Bay winter surveys, from 1974 to 1979, was identified. During this period, the creel census clerk, upon initiating the survey, always proceeded through the study area in a clockwise direction. Since daily effort and catch per unit of effort probably vary with time, the survey could be spatially and temporally biased. This potential for bias was mitigated in 1980 when the census clerk was instructed to alternate his starting direction.

In 1980, the survey was conducted by the Simcoe District, in co-operation with the LEFAU, incorporating the statistical concepts employed above. Similarly, the 1980 survey on Rondeau Bay was conducted by provincial park staff, in co-operation with the LEFAU.

Although study areas were not specifically defined during the period from 1958 to 1971, the locations would not be expected to change over time, as the areas physically conducive to ice fishing are usually restricted to sheltered bays. Known sampling information is summarized in Sztramko and Paine (1982).

SUMMER SHORELINE FISHERIES

A preliminary survey of anglers fishing from shore was conducted by the LEFAU during July and August, 1978 (Campbell and Paine 1979). The study area was defined as the entire length of Canadian shoreline from Bar Point at the mouth of the Detroit River, in the west, to the Peace Bridge on the Niagara River, in the east.

Angler counts were conducted by aerial surveys on a weekend day and a weekday, during each of a morning and afternoon period (four flights). Interviews were obtained from anglers fishing from docks, piers, breakwaters and at the mouths of tributaries of Lake Erie.

While stratification was incorporated into the design, the preliminary nature of the survey precluded obtaining replicate samples within strata and the subsequent measurement of the precision of estimates.

Although several surveys of anglers fishing from piers were undertaken between 1960 and 1970, study areas were not comparable to those defined in the lakewide study by Campbell and Paine (1979) and, consequently, were not included in this report.

SPRING RAINBOW SMELT FISHERY

The smelt sport fishery appeared to be reaching a significant level in 1957, when a preliminary survey was initiated at Point Pelee (Roseborough 1962). Point Pelee National Park staff employed an automatic car counter at the entry point to the park, thereby recording all vehicles entering the park during a 24-h period. Although the car-count records for the period during the smelt fishery (April 15-30) were lost, an estimate was provided based on the number of visitor entry permits issued (Bailey 1958).

The survey was repeated at Point Pelee Park in 1958 and 1959, as well as at 20 additional popular sites along Lake Erie (Roseborough 1962).

During the 1959 smelt surveys, census clerks in each area recorded the number of cars present at a given time, then interviewed between 10 and 20 parties (carloads) on completion of their trip. During the interview, the number of persons per party and the total harvest of smelt in pounds were recorded. Daily estimates of total anglers and harvest were then determined from the subsample.

Estimates for 13 of the 20 areas, for days which were not censused, were based on a tenuous approximation. The smelt fishing period in each area was defined as a 15-d period beginning on April 13, at Point Pelee in the western end of Lake Erie, with the approximate starting date for the other areas being successively delayed by one week in each of the central and eastern basins of the lake.

In areas where surveys had only been partially completed, i.e., 9 out of 15 days, a comparison was made to the Point Pelee area for the same 9 days. The percent of the total 15-d harvest and percent of the total 15-d anglers observed during these 9 days at Point Pelee were noted and used as the basis for estimates of the entire 15-d period in the partially surveyed area. The underlying assumption of a similar daily distribution of anglers and harvests through the entire Lake Erie shoreline is difficult to accept. Nevertheless, the areas in question would not greatly influence the overall lakewide estimates, as they accounted for only 13% of the total estimated lakewide effort and only 4% of the total estimated harvest.

An additional limitation of this survey, recognized by Roseborough (1959), was that the count of anglers at a given point in time was, in effect, an instantaneous count and not a count of the total numbers of anglers during the sampling period. Without knowledge of the daily distribution of the immigration/emigration rates and the exact count times, the instantaneous count would always be an underestimate of the daily total number of anglers which had used the area.

TRENDS IN SELECTED FISHERIES

Detailed evaluations of individual fisheries are beyond the scope of this work. Only three parameters (catch per unit of effort, change in mean age and growth rates), of the nine identified as necessary for gauging population and community responses to exploitation (Anonymous 1979), were collected over the years. Variations in creel census methods, and the frequency of scale sample collections required to determine age of fish in the harvest, further restricted the comparability of the data. In addition, the available data could be confounded by the effects of ambient water quality and habitat alterations. Catch per unit of effort (CUE) for a sport fishery is, by itself, a poor measure of population abundance and consequent vulnerability to angling. For example, Forney (1965) found that walleye were most vulnerable to anglers in years when their food supply was low. Without information on the fluctuation in forage abundance, attempts to interpret variations in CUE and hence, species aburdance, are somewhat speculative. Furthermore, the CUE used throughout the study period, i.e., the one for which most information is consistently available, is the number of fish kept (harvested) per angler-hour by all anglers. The potential weakness of this particular index is that it could, conceivably, be affected by shifts in the proportion of anglers seeking particular species, variations in size of fish available to anglers, and the relative availability of alternate species.

The major limitation affecting comparability of data is that documentation of annual survey methods, including areal definitions, is generally lacking prior to 1975. Although changes in fish communities have occurred over the years, the authors feel that general angling sites have not varied markedly. While a lack of information on pre-1975 survey biases precludes the application of rigorous analytical techniques, the data still may be used to provide clues to historical events.

In view of the foregoing, evaluation of selected fisheries has been restricted to the identification of prominent trends.

SUMMER BOAT FISHERIES

Estimated harvest and effort data for selected summer boat fisheries are presented in Tables 1 and 2, respectively. The relative precision of this data (confidence limits) is also provided.

Upper Niagara River

Traditionally, the major components of the harvest from this area have been yellow perch, smallmouth bass, rock bass (*Ambloplites rupestris*) and muskellunge (*Esox masquinongy*) (Sztramko and Paine 1982). Although there was no trend in CUE for individual species, the CUE for all species combined, during each of 1979 and 1980, was only half of pre-1972 levels (Table 3). Limited angling effort data showed no trends, and no effort estimates were available prior to 1974 (Table 4).

There were no trends in growth rates or mean age of harvest for smallmouth bass. Data on the mean length and weight-at-age of muskellunge are presented in Sztramko and Paine (1982).

Eastern Lake Erie

Smallmouth bass, yellow perch, and rock bass have been the main components of the harvest in Eastern Lake Erie (Sztramko and Paine 1982). Although the CUE for yellow perch declined slightly in Gravelly Bay, from 1977 to 1979, the CUE for all species combined remained stable (Table 5). Anglers who fished specifically for smallmouth bass experienced a relatively high CUE of 0.253-0.411 fish/angler-h (Sztramko and Paine 1982). Limited data indicate a relatively stable angling effort in recent years (Table 6). Since effort estimates are not available for 1959, it is not possible to determine if the difference in smallmouth bass harvest from 1959 to the present is real.

Limited data show a decline in the growth rates of two-, three-, four-, and five-year-old smallmouth bass in Gravelly Bay between 1976 and 1979 (Sztramko and Paine 1982). Growth information for other species in the Gravelly Bay harvest is presented in Sztramko and Paine (1982).

Long Point Bay

This fishery, for which most information is available, has long been renowned for the quality of its smallmouth bass fishing. In addition to smallmouth bass, other important components of the harvest have been yellow perch, rock bass, northern pike (*Esox lucius*) and largemouth bass (*Micropterus salmoides*) (Table 7).

The apparent decline, since 1968, in the CUE for smallmouth bass (Table 8) was investigated by Sztramko (in prep.). He related variations in angler success to a sanctuary regulation in effect from 1950 to 1967, inclusive. Essentially, the sanctuary was intended to protect spawning bass by preventing all angling in Inner Long Point Bay during May and June, prior to the traditional opening of the bass fishery on the last Saturday in June. Sztramko found that angler success rates for smallmouth bass, during the legal season when the sanctuary regulation was in effect, were significantly higher ($P<0.01$) than during the post-sanctuary period (1968-80).

Coble (1975) presented smallmouth bass CUE data for various fisheries in North America. He found that a CUE of 0.1 bass caught/angler-h was common, 0.25 bass/h occurred occasionally, and 1.1/h was rare. In this context, the CUE (0.298-0.352 fish/angler-h) experienced by smallmouth bass anglers, from 1978 to 1980, is very high (Table 9).

There appeared to be no difference in total angling effort among years (Table 10). In making this comparison, reported effort (Table 10) for 1963, 1964 and 1967 was reduced by 10% to allow for weathered-out days (see Review of Survey Methods, page 2). Also, total effort for 1979 and 1980 was reduced by 36,000 angler-h, which was the mean angling effort exerted during May and June prior to the opening day of the bass season in 1979 and 1980.

There are only three years (1966, 1967, 1979) of comparable growth information for smallmouth bass (Table 11). There are no trends in growth rates or in mean age of harvest. Smallmouth bass were usually first recruited into the fishery as two-year-olds (18.3-22.1 cm), but the majority of the harvest traditionally was three-, four- and five-year-old fish.

Yellow perch taken in the 1979 harvest were mainly composed of three- and four-year-olds, and rock bass were mainly four-, five-, and six-year-olds (Sztramko and Paine 1982).

Rondeau Bay

The main constituents of this fishery's harvest of warmwater species have been yellow perch, largemouth bass, bluegill (*Lepomis macrochirus*) and crappie (*Pomoxis* spp.) (Table 12). Over the years, the CUE for largemouth bass has varied from 0.009 to 0.100 fish/angler-h, with no apparent trend (Table 13). Since 1977, the CUE's for bluegill, crappie and pumpkinseed (*Lepomis gibbosus*) have declined considerably from earlier years (Table 13). During the period for which estimated angling effort is available, i.e., since 1977, effort has steadily declined (Table 14). While conclusive evidence is not available to explain the decline in effort, it may be attributed to poor success rates for the highly regarded bluegill and crappie, and the recent negative economic conditions in the United States, from where most of the anglers traditionally come. Witzel (1981c) detected a steady decline in the proportion of non-resident anglers since 1977.

There is no evidence of trends in the growth and mean-age parameters for largemouth bass, yellow perch and bluegill. Limited information on growth is presented for northern pike, black crappie (*Pomoxis nigromaculatus*) and white crappie (*Pomoxis annularis*) in Sztramko and Paine (1982).

Western Lake Erie

Since 1976, an excellent walleye fishery, in terms of CUE and numbers harvested, has developed in the offshore island area of the western basin of Lake Erie. This fishery has rivaled the historically important walleye fisheries of North America, with respect to angler success rates. From 1976-80, the CUE for walleye (number caught/h fished for all species) ranged from 0.524 to 0.928 fish/h (Witzel 1981a). Colby et al. (1979) compiled CUE data (number caught/h fished for all species) for numerous walleye fisheries throughout North America. Ranges in CUE for three of the more prominent fisheries during the 1960-74 period were: Lake Nipissing (0.12-0.58 fish/h), Lake of the Woods (0.34-0.97 fish/h), and Lac des Milles Lacs (0.4-1.6 fish/h).

The CUE for walleye appeared to improve in 1974 and 1975, then greatly improved in the following years (Table 15). Since 1975, the CUE for walleye has ranged from 0.440 to 0.737 fish/angler-h.

Besides walleye, which have dominated the harvest in numbers and popularity among anglers, other species harvested include smallmouth bass, yellow perch and channel catfish (Table 16). The CUE for species-specific anglers is presented in Table 17. Although the smallmouth bass fishery has been relatively small in terms of numbers harvested, the CUE, which ranged from 0.247 in 1978 to 0.768 fish/angler-h in 1979, was very good relative to North American success rates documented by Coble (1975). Annual angling effort since 1975 is presented in Table 18. It appears that annual effort has been relatively stable since 1976, ranging from 97,197 to 149,075 angler-h.

There were no apparent trends in growth rates or mean age of harvest for walleye; however, a slight decrease in the mean length-at-age of two-year-old fish occurred in 1979 and in 1980 (Table 19). This may have been a density-dependent response induced by the very strong 1977 year-class. Although one-year-old (31.2-32.2 cm) walleye were observed in the harvest, the majority of the harvest was comprised of two-, three-, and four-year-olds.

Lower Detroit River

The majority of the harvest in this area has been white bass and walleye (Table 20). These two species were normally taken in temporally discrete fisheries, with bass being harvested during May and June and walleye during July and August. Other species harvested included yellow

perch, freshwater drum, rock bass, and smallmouth bass. While the CUE for walleye has varied over the years, it has remained stable since 1975 (0.134-0.172 fish/angler-h) (Table 21). During 1956-80, variation in the CUE for white bass was more pronounced (0.170-1.540 fish/angler-h). The CUE for white bass was high in 1979 and in 1980. The strength of the fishery in 1979 and 1980 was attributed to the contribution of the very strong 1977 year-class. Total estimated effort has remained remarkably stable since 1976, ranging from 120,169 to 159,465 angler-h (Table 22).

Although there were no trends in growth parameters of walleye, a slight decrease in the mean length-at-age was observed for two-year-olds in 1979 and 1980 (Table 23). A similar response was noted for walleye in western Lake Erie, and a density-dependent response is proposed for this fishery as well. Walleye were first recruited to the fishery as one-year-olds (28.6-31.4 cm), but the harvest was usually composed of two-, three-, and four-year-old fish (Table 23).

No changes in growth rates were noted for white bass between 1976 and 1980 (Table 24). Nevertheless, there was a decline in mean age in 1979 and 1980. This probably resulted from recruitment of the strong 1977 year-class to the fishery. This year-class entered as two-year-olds in 1979 and persisted as three-year-olds in 1980. White bass were usually first recruited into the fishery as two-year-olds (24.4-25.8 cm). In 1976, three- (18.1 cm), four- (19.3 cm), and five-year-olds (20.4 cm) comprised the majority of the yellow perch harvest (Sztramko and Paine 1982).

WINTER ICE FISHERIES

Upper Niagara River

The little data available for this area show considerable variation in parameters, but no trends. Various parameters that are presented in Sztramko and Paine (1982) include: CUE, estimated harvest, and estimated effort.

Eastern Lake Erie

The major species in the Eastern Lake Erie harvest were yellow perch, rainbow smelt, and northern pike (Sztramko and Paine 1982). No apparent trends in harvest exist for any of the target species, or the CUE for all species combined. In addition, the limited angling effort information indicates no trend (Sztramko and Paine 1982).

Long Point Bay

The main species which comprised the harvest for this fishery included yellow perch, rainbow smelt and northern pike (Table 25). The yellow perch fishery, which appeared to be in a decline between 1975 and 1978, improved in 1979 and 1980 (Table 26). This improvement is attributed to the entry of the strong 1977 year-class. The CUE for anglers fishing specifically for yellow perch was an exceptionally high 8.580 fish/angler-h in 1980 (Sztramko and Paine 1982). Angling effort, which has varied from 100,293 to 46,591 angler-h in recent years (Table 27) probably is closely associated with the duration of ice-cover.

There are no apparent trends in growth parameters for yellow perch (Sztramko and Paine 1982). In 1972, two- and three-year-old perch made up most of the harvest, while in 1980, three- and four-year-olds were predominant.

Rondeau Bay

While yellow perch have traditionally dominated the harvest, a large number of rainbow smelt were harvested in 1980 (Sztramko and Paine 1982). Bluegill, crappie, northern pike, and pumpkinseed were taken in lesser numbers. The CUE for yellow perch has varied from 0.270 to 1.891 fish/angler-h (Table 28). Angling effort, on the other hand, has ranged from 1,445 to 9,035 angler-h (Table 29).

Western Lake Erie

The main species in the harvest, in terms of numbers, was yellow perch; rainbow smelt were taken to a much lesser degree (Sztramko and Paine 1982). Between 1962 and 1969, the CUE for yellow perch fluctuated from 4.815 to 9.910 fish/angler-h (Table 30). During 1970 and 1971, the CUE for perch declined considerably from earlier levels. Over the years, angling effort has varied considerably (from 3,693 to 105,680 angler-h) (Table 31), probably as a result of the duration of ice-cover.

Lower Detroit River

Data for this fishery are very limited. It appears that yellow perch was the major constituent of the winter harvest, with walleye being taken to a lesser extert (Sztramko and Paine 1982). During the two years for which data are available, the CUE for yellow perch ranged from 1.574 to 14.203 fish/angler-h. Based on very limited information, total effort was estimated at 1,121 angler-h in 1966 (Sztramko and Paine 1982).

MISCELLANEOUS

Northern Pike Spear Fishery

Reid (1977b) described a relatively minor northern pike spear fishery in Long Point Bay from 1973 to 1977. He found that the pike harvest from the marshes of the bay during the mid-March to mid-April fishery varied from 800 to 5,600 fish. During the same period, effort ranged from 2,100 to 4,500 angler-h. There were no apparent trends in either of the above parameters (Table 32).

In comparison to the spear fishery, the harvest of pike taken by angling from boats in May and June was 2,248 fish in 1976 (Reid 1977a) and 1,615 fish in 1980 (Owen 1980). Owen found that 78% of the pike were harvested in May and June, 17% in July and 5% in August.

Although a complementary fishery exists in the marshes along the shoreline of western Lake Erie, its characteristics have not been documented. Similarly, the Eagle Marsh Drain, west of the City of Port Colborne, supports a minor pike fishery of unknown significance (pers. comm., R. Lewies).

Rainbow Smelt Fishery

Roseborough (1962) traced the development of the smelt sport fishery from 1957 to 1960.

In 1959, the year during which most of the smelt areas were surveyed, 62% of the total effort directed at smelt was expended at Point Pelee National Park (Table 33), where 86% of the total smelt harvest was taken (Table 34). Roseborough (1962) estimated that the smelt harvest varied from approximately 3.0 million pounds in 1959 to 5.25 million in 1960.

Although directly comparable data are not available, limited information from several sources points to a relatively stable angler effort at Point Pelee Park (Table 35). A slight decline in effort occurred in the Port Dover-Turkey Point area, where estimated effort decreased from 50,000 angler-h in 1959 (Roseborough 1959) to 30,000 angler-h in 1976 (Reid 1977c).

CHARACTERISTICS OF THE LAKEWIDE FISHERY

The sport fishery in the Canadian waters of Lake Erie is characterized by a diversity of species and fishery types. Walleye fisheries dominate the Western Basin, with a walleye-white bass complex found in the Detroit River. A warm-water fishery of panfish and largemouth bass is found in Rondeau Bay; while at Long Point Bay, long famous for the quality of its smallmouth bass fishery, good yellow perch, largemouth bass and northern pike fishing can also be experienced. Smallmouth bass and yellow perch dominate the eastern Lake Erie fishery, with smallmouth bass and excellent musky fishing being found on the Niagara River. Fishery-types include summer-boat, summer-shoreline, winter-ice, spring-smelt, spring/fall rainbow trout (*Salmo gairdneri*) and brown trout (*Salmo trutta*) in tributaries and mouths of tributaries, and summer coho/chinook salmon (*Oncorhynchus kisutch/O. tshawytscha*) (Figure 1).

Annual angling effort in the Canadian waters of Lake Erie has been estimated in recent (post-1975) years at 1,180,000 angler-hours (Figure 2) or in excess of 250,000 angler-days, based on a mean angler-day of 4.6 hours (Table 36). This amount represents approximately 10% of the total annual lakewide (including U.S. waters) angling effort and approximately 1% of the total annual angling effort in Ontario (Appendix A). This estimate does not include fishery-types which have not been completely surveyed as yet: the coho/chinook salmon fishery in the late summer, the spring/fall trout fishery in tributaries and at the mouths of tributaries, and the northern pike spring spear fishery in the marshes of western Lake Erie.

The majority of total annual angling effort was expended in the summer-boat fishery (54% of total effort). The breakdown of effort by various classifications is provided in Figure 2.

Of the total annual angling effort expended in the summer-boat fishery, the majority occurred in Long Point Bay (42%), followed by the Detroit River (22%), western Lake Erie (20%), Rondeau Bay (9%), Niagara River (4%), and eastern Lake Erie (3%) (Figure 3).

Total annual harvest (1,028,000 fish) excluding rainbow smelt was dominated by the following four species: yellow perch (64% of total), white bass (11%), walleye (8%), and smallmouth bass (6%) (Figure 4). Species harvests were area-specific, with walleye being taken predominately in western Lake Erie and the Detroit River; white bass in the Detroit River; and yellow perch, smallmouth bass and rock bass in Long Point Bay (Figure 5).

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TABLES

Table 1. Estimated harvest of selected target species in the summer boat fisheries of Lake Erie and connecting waters, 1978-1980.

AREA	SPECIES	YEAR	HARVEST (number ± 95% confidence limits)
Upper Niagara River	Smallmouth bass	1980	6,262 ± 939 (15%)
Long Point Bay	Smallmouth bass	1979	71,646 ± 26,106 (36%)
		1980	47,306 ± 13,420 (28%)
	Yellow perch	1979	186,784 ± 36,719 (20%)
		1980	98,894 ± 29,888 (30%)
Rondeau Bay	Largemouth bass	1978	3,300 ± 1,730 (52%)
		1979	2,779 ± 1,140 (41%)
		1980	1,928 ± 956 (50%)
Western Basin	Walleye	1978	112,057 ± 43,813 (39%)
		1979	77,765 ± 35,176 (45%)
		1980	56,356 ± 14,210 (25%)
Lower Detroit River	Walleye	1978	25,101 ± 6,572 (26%)
		1979	26,753 ± 10,687 (40%)
		1980	30,697 ± 8,046 (26%)
	White bass	1978	15,311 ± 4,854 (32%)
		1979	98,808 ± 31,685 (32%)
		1980	103,382 ± 25,092 (24%)

Table 2. Estimated angling effort of selected summer boat fisheries in Lake Erie and connecting waters, 1978-1980.

AREA	YEAR	EFFORT (rod-h ± 95% confidence limits)
Upper Niagara River	1980	31,120 ± 7,857 (25%)
Long Point Bay	1978	206,840 ± 49,045 (24%)
	1979	301,047 ± 80,886 (27%)
	1980	219,372 ± 28,374 (13%)
Rondeau Bay	1978	67,327 ± 12,533 (19%)
	1979	51,658 ± 9,553 (18%)
	1980	38,970 ± 9,735 (25%)
Western Basin	1978	146,098 ± 55,133 (38%)
	1979	95,555 ± 33,307 (35%)
	1980	91,237 ± 21,403 (23%)
Lower Detroit River	1978	122,979 ± 17,243 (14%)
	1979	144,458 ± 24,163 (17%)
	1980	143,295 ± 18,844 (13%)

Table 3. Catch per unit of effort for species harvested in the summer boat fishery of the upper Niagara River, 1948-1980.[a,b]

YEAR	SMALL-MOUTH BASS	LARGE-MOUTH BASS	MUSKEL-LUNGE	WALL-EYE	NORTH-ERN PIKE	YELLOW PERCH	ROCK BASS	FRESH-WATER DRUM	PAN-FISH	RAIN-BOW TROUT	ALL	SOURCE
1948, 1955												
1956	0.284	0.000	0.007	0.064	0.002	0.040	0.031	0.045			0.472	Lands & Forests (1957)
1957, 1959												
1960	0.219					0.453		0.124			0.844	Roseborough (1960)
1961, 1966												
1967	0.290	0.004		0.001		0.400	0.090	0.100			0.900	Lands & Forests (1968)
1968												
1969	0.161			0.003					0.487		0.651	Lands & Forests (1970)
1970	0.137					0.010			0.608		0.755	Lands & Forests (1971)
1971	0.205	0.206		0.004		0.142	0.147	0.006			0.674	Lands & Forests (1972)
1972, 1973												
1974	0.500											Craig (1976a)
1974			0.094									Craig (1976b)
1975, 1978												
1979	0.035		0.010			0.291	0.021	0.001		0.004	0.362	LEFAU (1979)
1980[c]	0.139		0.003			0.111	0.108	0.001		0.008	0.378	LEFAU (1980)

[a] The catch per unit of effort is unweighted and represents the observed number of fish harvested divided by the observed effort in angler-hours for all anglers.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Includes the U.S. portion of the upper Niagara River.

Table 4. Estimated effort with associated sampling information for the summer boat fishery on the upper Niagara River, 1948-1980.[a,b]

YEAR	SAMPLING PERIOD	NO. OF DAYS SAMPLED	NO. OF PARTIES INTERVIEWED	NO. OF ANGLERS/ PARTY	PERCENTAGE OF CANADIAN PARTIES OF ALL PARTIES	ESTIMATED EFFORT (angler-h)	ESTIMATED EFFORT (rod-h)
1948 }							
1955 }							
1956	July-August	5			25		
1957 }							
1958 }							
1959	June 1-Sept. 20		433		14		18,149[e]
1960	June 20- Sept. 11				21		43,132[e]
1961 }							
1966 }							
1967		5			18		
1968							
1969	May-September				35		
1970	May				35		
1971					22		
1972 }							
1973 }							
1974	July-August			1.97	6	35,231	
1974[c]	July-August		118				
1975 }							
1978 }							
1979	June-August	15	203	2.18		15,382	15,301
1980[d]	July-August	28	142	2.33		33,240	31,120

[a] Annual sources as per Table 3.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Muskellunge survey by Craig (1976b).

[d] Includes the U.S. portion of the upper Niagara River.

[e] Represents estimated total number of anglers.

Table 5. Catch per unit of effort for species harvested in the summer boat fishery of eastern Lake Erie, 1948-1980.[a,b]

YEAR	SMALL-MOUTH BASS	LARGE-MOUTH BASS	BLUE PIKE/ WALLEYE	NORTHERN PIKE	YELLOW PERCH	FRESH WATER DRUM	ROCK BASS	COHO	PAN-FISH	ALL[c]	SOURCE
1948 }											
1955 }											
1956	0.190	0.001	0.067	0.006	0.068	0.089				0.427	Roseborough (1960)
1957	0.695	0.000	0.024	0.000	0.589	0.032	0.003			0.746	Roseborough (1960)
1958	0.179		0.002		3.348	0.115				3.644	Roseborough (1960)
1959 }											
1968 }											
1969	0.045		0.005						0.559	0.609	Lands & Forests (1970)
1970	0.185			0.008	0.459				0.188	0.840	Lands & Forests (1971)
1971	0.453	0.001	0.000	0.000	1.296	0.019	0.140	0.006		2.669	Lands & Forests (1972)
1972 }											
1975 }											
1976[d]	0.180	0.001	0.005	0.005	0.250	0.030	0.140				Craig et al. (1976)
1977[d]	0.120	0.001	0.001	0.001	0.289	0.006			0.050	0.468	Gretsinger et al. (1978)
1978[d]	0.164		<0.001	0.003	0.222	0.071	0.198		0.011	0.669	Gretsinger et al. (1979)
1979[d]	0.112		0.001	0.010	0.188	0.036	0.122			0.474	LEFAU (1979)
1979[e]	0.279			0.008	0.154	0.011	0.059			0.514	LEFAU (1979)
1979[f]	0.305			0.002	0.134	0.053	0.051			0.547	LEFAU (1979)
1980											

[a] The catch per unit of effort (CUE) is unweighted and represents the observed number of fish harvested divided by the observed effort in angler-hours for all anglers.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Includes bullhead and white bass.

[d] Specific areal designation = Gravelly Bay.

[e] Specific areal designation = Morgan Pt. - Lorraine Pt.

[f] Specific areal designation = Lorraine Pt. - Pt. Abino.

Table 6. Estimated effort with associated sampling information for the summer boat fishery of eastern Lake Erie, 1948-1980.[a,b]

YEAR	SAMPLING PERIOD	NO. OF DAYS SAMPLED	NO. OF PARTIES INTERVIEWED	LENGTH OF A SAMPLING PERIOD	NO. OF ANGLERS/ PARTY	PERCENTAGE OF CANADIAN PARTIES OF ALL PARTIES	ESTIMATED EFFORT (angler-h)	ESTIMATED EFFORT (rod-h)
1948 } 1955								
1956	July-August	7				57		
1957		12				61		
1958						48		
1959	June 1-Sept. 20		203			49		13,399[c]
1960 } 1968								
1969	May-September					59		
1970	June-July					56		
1971						50		
1972 } 1975								
1976	June 27-Sept. 6		227			87	18,934	
1977	June 26-Sept. 5						15,400	
1978	June 24-Aug. 31						16,700	
1979	June-August	69	404		2.37	90		
1980								

[a] Annual sources as per Table 5.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Represents estimated total number of anglers.

Table 7. Estimated harvest in numbers of fish for the summer boat fishery on Long Point Bay, Lake Erie, 1948-1980.[a,b]

YEAR	SMALL-MOUTH BASS	LARGE-MOUTH BASS	NORTHERN PIKE	YELLOW PERCH	BLUEGILL	ROCK BASS	PUMPKINSEED	CRAPPIE	BULLHEAD	FRESHWATER DRUM	CATFISH	WALLEYE	OTHER	TOTAL
1948 } 1958														
1959	79,648	288	800	49,664	112	19,472	960	16	16	480			144	151,600
1960	156,015		195	22,431		6,861	186			156	15			185,859
1961	106,062		339	26,004		11,853			42	657				144,957
1962	133,959	24	1,926	31,134	501	13,734	186			432			51	181,974
1963	154,791	18	2,121	80,472	15	17,121	2,724			501	54	66		257,883
1964	65,842	3	144	75,525		15,049	1,598		6	488	32	17	106	158,813
1965														
1966														
1967	97,026	1,395	753	81,549	1,119	32,607	1,254	441		1,743		18		217,905
1968 } 1977														
1978	41,316	2,262	1,741	49,446		33,123	1,917				221		6,035	136,061
1979	70,329	2,360	2,914	128,808		64,102	2,856	204	235	3,181			225	275,214
1980	47,306	4,098	2,077	98,894		52,760	3,472	953		2,858	95		108	212,621

[a] Annual sources as per Table 8.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

Table 8. Catch per unit of effort for species harvested in the summer boat fishery of Long Point Bay, Lake Erie, 1948-1980.[a,b]

YEAR	SMALL-MOUTH BASS	YELLOW PERCH	ROCK BASS	LARGE-MOUTH BASS	FRESH-WATER	NORTHERN PIKE	ALL[c]	SOURCE
1948	0.360	0.184	0.062					Berst (1951)
1949								Lands & Forests (1950)
1950								Lands & Forests (1951)
1951	0.304	0.219	0.018			0.028		Berst (1951)
1952								Lands & Forests (1953)
1953								Lands & Forests (1954)
1954								Lands & Forests (1955)
1955								Lands & Forests (1956)
1956	0.411	0.074	0.061	0.003	0.002	0.008	0.588	Lands & Forests (1957)
1957	0.146	0.043	0.051	0.002	0.004	0.006	0.268	Lands & Forests (1958)
1958	0.293	0.164	0.080	0.002	0.002	0.008	0.552	Lands & Forests (1959)
1959								Lands & Forests (1960)
1960	0.610	0.095	0.020		0.001	0.001	0.730	Roseborough (1960)
1961	0.471	0.162	0.082		0.005	0.002	0.725	Lands & Forests (1962)
1962	0.365	0.115	0.048		0.002	0.010	0.544	Lands & Forests (1963)
1963	0.516	0.269	0.050	0.002	0.002	0.008	0.857	Lands & Forests (1964)
1964	0.374	0.225	0.049		0.004	0.001	0.661	Lands & Forests (1965)
1965	0.337	0.183	0.031		0.001	0.002	0.557	Lands & Forests (1966)
1966	0.302	0.377	0.141	0.003	0.003	0.001	0.832	Lands & Forests (1967)
1967	0.330	0.277	0.110	0.005	0.006	0.003	0.741	Lands & Forests (1968)
1968	0.235	0.314		0.002		0.006	0.790	Lands & Forests (1969)
1969	0.177			0.013		0.009	0.664	Lands & Forests (1970)
1970	0.131	0.326		0.002		0.026	0.734	Lands & Forests (1971)
1971	0.190	0.370	0.050	0.006	0.007	0.016	0.652	Hamley et al. (in prep.)
1972	0.338	0.245	0.067	0.001	0.004	0.010	0.675	Hamley et al. (in prep.)
1973	0.229	0.373	0.100	0.006	0.014	0.026	0.780	Hamley et al. (in prep.)
1974	0.245	0.335		0.002	0.039	0.028	0.852	Hamley et al. (in prep.)
1975	0.238	0.290	0.101	0.007	0.017	0.014	0.724	Hamley et al. (in prep.)
1976	0.281	0.294		0.002		0.024	0.684	Hamley et al. (in prep.)
1977	0.292	0.335	0.298	0.007		0.011	1.034	Hamley et al. (in prep.)
1978	0.197	0.261	0.164	0.008	0.022	0.008	0.673	LEFAU (1978)
1979	0.185	0.499	0.169	0.008	0.010	0.009	0.897	Powell (1980)
1980	0.163	0.493	0.203	0.015	0.011	0.009	0.919	Owen (1980)

[a] The catch per unit of effort (CUE) is unweighted and represents the observed number of fish harvested divided by the observed effort in angler-hours for all anglers.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Includes bluegill, white and black crappie, and yellow and brown bullhead.

Table 9. Catch per unit of effort for species caught in the summer boat fishery of Long Point Bay, Lake Erie, 1948-1980.[a,b]

YEAR	SMALLMOUTH BASS	YELLOW PERCH	ROCK BASS	LARGEMOUTH BASS	FRESHWATER DRUM	NORTHERN PIKE	SOURCE
1948 } 1977							
1978	0.298	1.369	1.514	0.391		0.084	LEFAU (1978)
1979	0.352	2.943	1.284	0.336	0.500	0.163	LEFAU (1979)
1980	0.334	3.238	1.730	0.256		0.171	LEFAU (1980)

[a] The catch per unit of effort (CUE) is unweighted and represents the observed number of fish caught divided by the observed effort in rod-hours for anglers seeking the species listed.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

Table 10. Estimated effort with associated sampling information for the summer boat fishery on Long Point Bay, Lake Erie, 1948-1980.[a,b]

YEAR	SAMPLING PERIOD	NO. OF DAYS SAMPLED	NO. OF PARTIES INTERVIEWED	LENGTH OF A SAMPLING PERIOD	NO. OF ANGLERS/ PARTY	PERCENTAGE OF CANADIAN PARTIES OF ALL PARTIES	ESTIMATED EFFORT (angler-h)	ESTIMATED EFFORT (rod-h)
1948 } 1955								
1956	July-August					88		
1957	Apr.'57-Apr.'58	25				90		
1958	Apr.'58-Mar.'59					95		
1959	June 1-Sept. 20	28	518	8-h	4.32	91		48,470[c]
1960	June 20-Sept. 11	18	754	8-h	4.04	94		75,800[c]
1961	June 24-Sept. 3	18	472	8-h	3.93	95		59,963[c]
1962	June 23-Sept. 2	18	622	8-h	4.32	95		122,549[c]
1963	June 22-Sept. 1	13	390	8-h	4.28	91	290,135	83,854[c]
1964	June 27-Sept. 13	20	829	8-h	3.80	95	197,513	55,851[c]
1965	June 26-Sept. 4	19	828			92		
1966	June 25-	27				93		
1967	June 24	26	782			98	294,249	72,258[c]
1968	July 29-Sept. 15	25	869		4.10	97		
1969	June 28-Sept.					93		
1970	June 27-Sept.					96		
1971	June 26-Aug. 29	19						
1972	June 14-Aug. 27	41						
1973		24						
1974	June 25-Aug. 22	23						
1975	June 19-Aug. 31	19						
1976	June 26-Aug. 31	16						
1977	June 25-Aug. 31	18						
1978	June 20-Aug. 31	47	823	7-h	3.03	90	216,882	206,840
1979	May 7-Sept. 9	48	1,167	7-h	3.15	96	295,44[illegible]	279,424
1980	May 5-Aug. 31	56	1,015	7-h	3.04	96	227,902	219,372

[a] Annual sources as per Table 8 except 1979 which is LEFAU (1979) and includes the September 1-9 period.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Represents estimated total number of anglers.

Table 11. Total length-at-age (in cm) and mean age of smallmouth bass harvested in the summer boat fishery of Long Point Bay, Lake Erie, 1948-1980.

YEAR	STATISTIC	AGE II	III	IV	V	VI	VII	VIII	IX	X	XI	MEAN LENGTH	MEAN AGE	SOURCE
1948	n		7	72	27	7	4	3	2		1			
	$\bar{x}$		-	-	-	-	-	-	-		-	-	4.6	Anonymous (1950?)
	s		-	-	-	-	-	-	-		-			
1952	n		-	-	-									
	$\bar{x}$		28.45	32.26	34.80							-	-	Lands & Forests (1953)
	s		-	-	-									
1956	n													
	$\bar{x}$											27.94[a]	-	Lands & Forests (1957)
	s													
1957	n													
	$\bar{x}$											27.94[a]	-	Lands & Forests (1958)
	s													
1960	n													
	$\bar{x}$											26.92	-	Reynolds (1961)
	s													
1961	n													
	$\bar{x}$											28.96	-	Reynolds (1961)
	s													
1962	n													
	$\bar{x}$											29.21[b]	-	Lands & Forests (1963)
	s													
1966	n	7	186	173	50	12	9							
	$\bar{x}$	18.31	23.34	27.81	31.65	35.99	38.81					26.64	3.8	Lands & Forests (1967)
	s	-	-	-	-	-	-							
1967	n	5	42	153	89	49	13	6						
	$\bar{x}$	22.09	25.15	28.09	30.30	34.39	38.00	41.91				29.67	4.6	Lands & Forests (1968)
	s	-	-	-	-	-	-	-						
1971	n	8	46	7										
	$\bar{x}$		22.32	24.41								22.60[c]	3.0	Kelso (1973)
	s		-	-										
1972	n	24	78	39	5									
	$\bar{x}$	17.75	22.29	27.00	30.14							23.07[c]	3.2	Kelso (1972)
	s	-	-	-	-									
1979	n	1	46	56	39	26	6	4						
	$\bar{x}$	29.00	25.01	29.30	32.71	35.65	42.25	35.00				29.83	4.4	Reid (1981)
	s	-	3.84	2.91	3.80	3.02	2.91	6.34						

[a] Represents modal length.

[b] Mean length of fish on opening weekend only.

[c] Kelso (1973, 1972) reported back-calculated fork lengths (FL) at annulus formation. These were converted to total lengths (TL) by Carlander's (1977) formula where TL = 1.04 FL. These back-calculated lengths are smaller than actual measurements used in other years as they do not allow for growth which normally occurs during the course of the summer fishery.

Table 12. Estimated harvest in numbers of fish for the summer boat fishery on Rondeau Bay, Lake Erie, 1948-1980.[a,b]

YEAR	SMALL-MOUTH BASS	LARGE-MOUTH BASS	NORTHERN PIKE	YELLOW PERCH	BLUEGILL	ROCK BASS	PUMPKINSEED	CRAPPIE	BULLHEAD	CATFISH	FRESHWATER DRUM	OTHER	WALLEYE	TOTAL
1948 } 1958														
1959	720	880	1,312	45,728	23,088	3,552	33,584	1,680	688	352	416			112,000
1960	1,048	775		8,657	8,356	1,436	6,498							27,583
1961	1,890	1,586	54	7,840	20,370	682	20,023	141	54	33	98			52,738
1962	1,003	645	374	12,161	11,774	621	9,192	2,331	259	45	156			38,561
1963 } 1976														
1977	189	9,980	3,774	19,395	25,868	4,262	3,257	15,342	484	71	943	636	178	84,329
1978	139	3,300	2,002	8,314	8,528	711	1,666	8,977	166	158	1,300	728	56	36,045
1979	181	2,779	850	11,847	2,165	1,286	1,209	1,448	84		871	399	444	23,563
1980	93	1,928	593	15,463	1,683	297	862	1,066	83	377	780		152	23,668

[a] Annual sources as per Table 13.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

Table 13. Catch per unit of effort for species harvested in the summer boat fishery of Rondeau Bay, Lake Erie, 1948-1980.[a,b]

YEAR	LARGE-MOUTH BASS	SMALL-MOUTH BASS	NORTH-ERN PIKE	MUSKEL-LUNGE	YELLOW PERCH	WALL-EYE	BLUE-GILL	CRAPPIE	PUMPKIN-SEED	PAN-FISH	ALL[c]	SOURCE
1948	0.075											Loftus (1948)
1949												
1950	0.015	0.004	0.083	<0.001		0.041						Berst (1950)
1951 } 1955												
1956	0.017	0.026	0.051	0.000	0.243		0.572	0.058			1.081	Lands & For. (1957)
1957					0.750		0.714				1.464	Lands & For. (1958)
1958	0.009	0.035	0.054		0.751		0.440	0.045	0.142		1.602	Lands & For. (1959)
1959												
1960	0.042	0.057			0.471		0.454		0.353		1.500	Roseborough (1960)
1961	0.048	0.061	0.002		0.300		0.644	0.007	0.694		1.798	Lands & For. (1962)
1962	0.039	0.054	0.020		0.583		0.461	0.123	0.263		1.594	Lands & For. (1963)
1963 } 1966												
1967	0.100	0.006	0.010		0.440		0.840	0.080	0.290		1.860	Lands & For. (1968)
1968												
1969	0.063	0.007	0.009							1.082	1.160	Lands & For. (1970)
1970	0.025	0.037	0.012							2.377	2.465	Lands & For. (1971)
1971 } 1976												
1977	0.088	0.002	0.032	0.000	0.179	0.003	0.259	0.116	0.031		0.793	LEFAU (1977)
1978	0.044	0.004	0.027	0.000	0.151	0.001	0.095	0.075	0.036		0.490	Dunlop and Sztramko (1979)
1979	0.056	0.004	0.016	0.000	0.224	0.009	0.052	0.030	0.032		0.475	Sztramko (1980c)
1980	0.045	0.003	0.015		0.345	0.003	0.037	0.026	0.025		0.549	Witzel (1981c)

[a] The catch per unit of effort is unweighted and represents the observed number of fish harvested divided by the observed effort in angler-hours for all anglers.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Includes channel catfish, yellow and brown bullhead, and freshwater drum.

Table 14. Estimated effort with associated sampling information for the summer boat fishery on Rondeau Bay, Lake Erie, 1948-1980.[a,b]

YEAR	SAMPLING PERIOD	NO. OF DAYS SAMPLED	NO. OF PARTIES INTERVIEWED	LENGTH OF A SAMPLING PERIOD	NO. OF ANGLERS/ PARTY	PERCENTAGE OF CANADIAN PARTIES OF ALL PARTIES	ESTIMATED EFFORT (angler-h)	ESTIMATED EFFORT (rod-h)
1948 }								
1955 }								
1956	August-September	7				35		
1957		1				100		
1958						29		
1959	June 1-Sept. 20		310			31		9,493[c]
1960	June 20-Sept. 11					27		7,544[c]
1961	July 7-Sept. 3	14	217		2.13	22		9,001[c]
1962	June 23-Sept. 2	15	148		2.21	30		7,894[c]
1963 }								
1966 }								
1967		17				16		
1968								
1969	June-August					24		
1970	June-August					25		
1971 }								
1976 }								
1977	June 1-August 31	31	518	6-h	2.48	20	89,875	95,515
1978	June 1-Sept. 30	40	521	6-h	2.53	31	64,544	67,327
1979	June 1-August 31	29	545	6-h	2.42	35	49,452	51,658
1980	June 1-August 31	30	372	6-h	2.44	44	38,315	38,970

[a] Annual sources as per Table 13.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Represents estimated total number of anglers.

Table 15. Catch per unit of effort for species harvested in the summer boat fishery of western Lake Erie, 1948-1980.[a,b]

YEAR	SMALL-MOUTH BASS	LARGE-MOUTH BASS	WALL-EYE	NORTHERN PIKE	YELLOW PERCH	CHANNEL CATFISH	FRESH-WATER DRUM	WHITE BASS	PAN-FISH	ALL[c]	SOURCE
1948 } 1955											
1956	0.008		0.093	<0.001	0.390	0.028	0.171	0.008		0.750	Lands & Forests (1957)
1957											
1958					1.702		0.142			1.872	Lands & Forests (1959)
1959 } 1965											
1966	0.054		0.000	0.000	2.607	0.013	0.138	0.375		3.201	Lands & Forests (1967)
1967	0.020	0.020	0.070		1.157		0.481			1.761	Lands & Forests (1968)
1968											
1969	0.007	0.001	0.000	0.003					1.168	1.179	Lands & Forests (1970)
1970											
1971	0.066	0.004	0.107		0.191	0.057		0.006		0.815	Lands & Forests (1972)
1972											
1973											
1974*			0.165								Lincoln (1975)
1975*			0.157								Duckworth and Paine (1975)
1976*			0.505								Paine and Witherspoon (1977)
1977	0.019		0.440		0.035	0.012	0.032	0.005		0.544	Hector (1978)
1978	0.025		0.653		0.028	0.023	0.032	0.020		0.781	Sztramko (1979a)
1979	0.039		0.737		0.031	0.012	0.005	0.021		0.846	Sztramko (1980a)
1980	0.050		0.556		0.039	0.016	0.010	0.007		0.678	Witzel (1981a)

[a] Except where year is denoted by an asterisk (*), the catch per unit of effort (CUE) is unweighted and represents the observed number of fish harvested, divided by the observed effort in angler-hours for all anglers. Given the above exception, the CUE is weighted, viz., estimated total number of fish harvested is divided by the total estimated effort.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Includes bluegill, carp, crappie and bullhead.

Table 16. Estimated harvest in numbers of fish for the summer boat fishery of western Lake Erie, 1948-1980.[a,b]

YEAR	SMALLMOUTH BASS	WALLEYE	SAUGER	YELLOW PERCH	ROCK BASS	CATFISH	FRESHWATER DRUM	WHITE BASS	OTHER	TOTAL
1948 } 1958										
1959	18	3		257	9	6	17		46	356
1960 } 1973										
1974		14,811								
1975		7,177								
1976		49,029								
1977	1,841	68,954	12	4,620		1,181	1,599	501		78,708
1978	4,187	112,057		4,954		3,572	7,799	1,310	32	133,911
1979	3,017	77,765		3,125		1,660	578	1,273		87,478
1980	2,625	56,356		4,484	22	1,714	541	550		66,292

[a] Annual sources as per Table 15.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

Table 17. Catch per unit of effort for species caught in the summer boat fishery of western Lake Erie, 1948-1980.[a,b,c]

YEAR	SMALLMOUTH BASS	WALLEYE	YELLOW PERCH	CHANNEL CATFISH	FRESHWATER DRUM	WHITE BASS
1948 } 1976						
1977	0.263	0.483			0.048	4.000
1978	0.247	0.758				
1979	0.768	0.886		0.167		0.387
1980	0.392	0.672	0.212	0.187	0.951	1.103

[a] The catch per unit of effort is unweighted and represents the observed number of fish caught divided by the observed effort in rod-hours for anglers seeking the species listed.

[b] Annual sources as per Table 15.

[c] Missing values indicate that either surveys were not conducted or that required data were unavailable.

Table 18. Estimated effort with associated sampling information for the summer boat fishery of western Lake Erie, 1948-1980.[a,b]

YEAR	SAMPLING PERIOD	NO.OF DAYS SAMPLED	NO.OF PARTIES INTERVIEWED	LENGTH OF A SAMPLING PERIOD	NO.OF ANGLERS/ PARTY	PERCENTAGE OF CANADIAN PARTIES OF ALL PARTIES	ESTIMATED EFFORT (angler-h)	ESTIMATED EFFORT (rod-h)
1948 }								
1955 }								
1956	July-September	25				35		
1957								
1958						23		
1959[c]	June 1-Sept. 20		76			65		
1960 }								
1965 }								
1966						9		
1967		6				5		
1968								
1969[c]	July-September					36		
1970								
1971[c]						17		
1972								
1973								
1974	June-September					7		89,525
1975	June 17-Sept. 13	60		5-h		3	53,651	53,696
1975[d]	June 17-Sept. 13	60		5-h		71	8,019	8,105
1976	July 1-Aug. 31	41		5-h		3	98,541	97,176
1977	July 1-Aug. 31	41	534	5-h	3.49	1	130,148	129,179
1978	July 1-Aug. 31	42	336	5-h	3.31	3	149,075	146,098
1979	July 1-Aug. 31	42	362	5-h	3.34	5	97,197	95,555
1979[e]	July 8-Aug. 31		123	6-h	2.44	93	13,806	13,339
1980	July 1-Aug. 31	42	413	5-h	3.28	12	96,377	91,237

[a] Annual sources as per Table 15.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Specific areal designation = Pigeon Bay.

[d] Specific areal designation = Pigeon Bay from Colchester to Point Pelee, south to upbound shipping lane.

[e] Specific areal designation = Colchester Reef - Grecian Shoal.

Table 19. Total length-at-age (in cm) and mean age of walleye harvested in the summer boat fishery of western Lake Erie, 1974-1980.

YEAR	STATISTIC	AGE									MEAN LENGTH	MEAN AGE	SOURCE
		I	II	III	IV	V	VI	VII	VIII	IX			
1974	n		49	59	71	17							
	$\bar{x}$		40.58	46.88	52.50	54.17					47.97	3.3	Lincoln (1975)[a]
	s		-	-	-	-							
1975	n	8	74	48	32	41	7	3	2	1			
	$\bar{x}$	31.73	40.42	45.28	49.06	54.04	56.70	60.66	58.59	69.25	46.51	3.8	Duckworth and
	s	2.92	1.77	3.89	3.61	4.26	4.00	6.44	4.97	-			Paine (1975)
1976	n	4	55	11	4	3	1						
	$\bar{x}$	31.19	40.77	52.38	56.16	57.42	62.64				43.63	2.4	Paine and Witherspoon (1977)
	s	2.47	2.24	5.21	4.58	3.43	-						
1977	n	1	73	41	13	4	2						
	$\bar{x}$	39.00	40.60	48.20	53.20	59.80	59.50				44.99	2.6	Hector (1978)
	s	-	3.78	3.73	6.08	10.24	12.02						
1978	n	3	27	86	23	6	3	1					
	$\bar{x}$	32.17	41.06	44.17	49.46	52.46	57.84	47.50			44.81	3.1	Sztramko (1979a)
	s	2.02	1.49	2.46	3.10	3.68	2.02	-					
1979	n		95	34	29	2	3						
	$\bar{x}$		38.40	45.84	51.48	59.00	62.83				42.98	2.7	Sztramko (1980a)
	s		2.37	3.29	3.50	8.49	8.59						
1980	n		85	79	25	8	2		1				
	$\bar{x}$		39.78	44.54	49.84	58.19	58.00		68.00		43.98	2.8	Witzel (1981a)
	s		2.77	2.52	5.12	3.27	2.83		-				

[a] Lincoln (1975) utilized fork length measurements (FL) which have been converted to total lengths (TL) via the least squares regression TL = 1.11 FL - 1.28 using the data of Duckworth and Paine (1975).

Table 20. Estimated harvest in numbers of fish for the summer boat fishery on the lower Detroit River, 1948-1980.[a,b]

YEAR	SMALL-MOUTH BASS	LARGE-MOUTH BASS	MUSKEL-LUNGE	BLUE PIKE/ WALLEYE	NORTH-ERN PIKE	YELLOW PERCH	BLUE-GILL	ROCK BASS	PUMP-KIN-SEED	WHITE BASS	CAT-FISH	FRESH-WATER DRUM	OTHER[c]	TOTAL
1948 }														
1958 }														
1959	2,272	80	240	25,856	1,680	19,040	256	6,720	640	30,448	512	18,448	2,272	108,464
1960	10,536					33,558				112,716		34,566		236,451
1961 }														
1973 }														
1974				4,994										
1975				12,546										
1976				23,001						32,511				
1977	376	57	19	26,520	807	12,132		9,398	136	34,857	671	17,957	2,770	114,460
1978	80			25,101	81	7,412		3,338		15,311	382	15,702	281	67,688
1979	265	18		26,753	122	9,198		4,487		98,808	545	9,473	400	150,069
1980	704	29	0	30,697	115	11,903	139	2,619	0	103,382	587	10,340		161,644

[a] Annual sources as per Table 21.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Includes various species of bullhead and crappie.

Table 21. Catch per unit of effort for species harvested in the summer boat fishery of the lower Detroit River, 1948-1980.[a,b]

YEAR	SMALL-MOUTH BASS	MUSKEL-LUNGE	BLUE PIKE/ WALLEYE	NORTHERN PIKE	YELLOW PERCH	ROCK BASS	WHITE BASS	FRESH-WATER DRUM	COHO	ALL[c]	SOURCE
1948 } 1955											
1956	0.071	0.003	0.152	0.049	0.447	0.078	1.540			2.398	Lands & For. (1957)
1957	0.003	0.000	0.300	0.015	0.192	0.088	1.182			1.852	Lands & For. (1958)
1958	0.028	0.004	0.249	0.007	0.131	0.067	0.341	0.080		0.899	Lands & For. (1959)
1959											
1960	0.076				0.241		0.809	0.248		1.697	Roseborough (1960)
1961 } 1969											
1970	0.031			0.031	0.480					0.540	Lands & For. (1971)
1971 } 1973											
1974[d]			0.202								Lincoln (1975)
1975*			0.172								Duckworth and Paine (1975)
1976*			0.144				0.204				Paine and Witherspoon (1977)
1977	0.003	<0.001	0.172	0.002	0.096	0.069	0.299	0.134		0.801	Hector (1978)
1978	<0.001	0.000	0.172	<0.001	0.059	0.032	0.170	0.068	<0.001	0.511	Sztramko (1979b)
1979	0.002	0.000	0.134	0.004	0.086	0.043	0.796	0.072		1.148	Sztramko (1980b)
1980	0.004	0.000	0.171	0.003	0.097	0.026	1.003	0.070		1.387	Witzel (1981b)

[a] Except where year is denoted by an asterisk (*), the catch per unit of effort (CUE) is unweighted and represents the observed number of fish harvested, divided by the observed effort in angler-hours for all anglers. Given the above exception, the CUE is weighted, viz., estimated total number of fish harvested is divided by the total estimated effort.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Includes various species of sucker and catfish.

[d] Only rod-hours were reported by Lincoln (1975) and were assumed by him to be equivalent to angler-hours.

Table 22. Estimated effort with associated sampling information for the summer boat fishery of the lower Detroit River, 1948-1980.[a,b]

YEAR	SAMPLING PERIOD	NO. OF DAYS SAMPLED	NO.OF PARTIES INTERVIEWED	LENGTH OF A SAMPLING PERIOD	NO. OF ANGLERS/ PARTY	PERCENTAGE OF CANADIAN PARTIES OF ALL PARTIES	ESTIMATED EFFORT (angler-h)	ESTIMATED EFFORT (rod-h)
1948 }								
1955 }								
1956	June-September	2				8		
1957		7				12		
1958						35		
1959	June 1-Sept. 20		406			20		17,129[c]
1960	June 20-Sept. 11					15		40,079[c]
1961 }								
1969 }								
1970	June 27	1				100		
1971 }								
1973 }								
1974	June-September					9		24,699
1975	June 17-Sept. 13	30				13	73,129	81,019
1976	May 17-Aug. 31	36		7-h		23	159,465	163,117
1977	May 20-Aug. 31	34	715	6-h	2.14	5	151,436	168,595
1978	May 18-Aug. 31	40	660	6-h	2.21	19	120,169	122,979
1979	May 17-Aug. 31	38	911	6-h	2.21	27	132,458	144,458
1980	May 14-Aug. 31	42	703	6-h	2.26	34	136,081	143,295

[a] Annual sources as per Table 21.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Represents estimated total number of anglers.

Table 23. Total length-at-age (in cm) and mean age of walleye harvested in the summer boat fishery of the lower Detroit River, 1974-1980.

YEAR	STATISTIC	AGE									MEAN LENGTH	MEAN AGE	SOURCE
		I	II	III	IV	V	VI	VII	VIII	IX			
1974	n		38	39	35	1							
	$\bar{x}$		39.92	45.48	48.00	42.23					44.36	3.0	Lincoln (1975)[a]
	s		-	-	-	-							
1975	n	7	26	88	119	52	10	4					
	$\bar{x}$	31.35	39.94	43.80	47.18	52.30	54.39	60.64			46.15	3.3	Duckworth and Paine (1975)
	s	1.93	2.56	2.98	3.47	6.42	2.33	5.26					
1976	n	10	77	15	17	8	9	1	1				
	$\bar{x}$	28.82	38.06	44.66	50.96	53.35	58.62	63.53	57.75		42.25	2.8	Paine and Witherspoon (1977)
	s	2.98	2.84	3.55	2.94	4.84	4.66	-	-				
1977	n		70	51	14	2	6	2					
	$\bar{x}$		39.50	44.50	51.90	51.80	61.80	60.50			43.84	2.8	Hector (1978)
	s		3.20	3.32	3.89	3.18	6.91	-					
1978	n	7	44	121	13	1	5	1					
	$\bar{x}$	28.57	40.84	45.18	48.54	62.50	65.10	80.00			44.60	2.9	Sztramko (1979b)
	s	1.31	2.61	3.00	2.58	-	9.16	-					
1979	n		81	15	7								
	$\bar{x}$		36.65	45.67	47.28						38.69	2.3	Sztramko (1980b)
	s		2.89	3.97	3.56								
1980	n	1	82	93	11	4	2	0	1	1			
	$\bar{x}$	37.00	37.37	43.05	49.68	52.75	57.50	-	52.50	60.00	41.49	2.8	Witzel (1981b)
	s	-	2.64	3.66	5.06	1.26	3.54	-	-	-			

[a] Lincoln (1975) utilized fork length measurements (FL) which have been converted to total lengths (TL) via the least squares regression TL = 0.23 + 1.05 FL using the data of Duckworth and Paine (1975).

Table 24. Total length-at-age (in cm) and mean age of white bass harvested in the summer boat fishery of the lower Detroit River, 1976-1980.

YEAR	STATISTIC	AGE							MEAN LENGTH	MEAN AGE	SOURCE
		II	III	IV	V	VI	VII	VIII			
1976	n	11	42	47	7	1			31.76	3.5	Paine and Witherspoon (1977)
	$\bar{x}$	25.68	31.02	33.26	35.71	31.50					
	s	2.35	2.42	1.88	1.89	-					
1977	n	2	38	19	16	3			32.18	3.7	Hector (1978)
	$\bar{x}$	25.80	30.60	34.40	33.40	36.00					
	s	3.89	4.97	10.18	1.92	3.28					
1978	n	42	16	52	20	17	6	1	30.78	3.8	Sztramko (1979b)
	$\bar{x}$	25.42	29.10	31.74	34.35	35.86	36.59	40.00			
	s	1.96	1.76	2.20	2.32	2.40	2.23	-			
1979	n	113	32	8	1	1			27.10	2.4	Sztramko (1980b)
	$\bar{x}$	25.53	30.25	34.27	35.00	38.50					
	s	1.37	1.86	1.83	-	-					
1980	n	15	123	8	4				29.33	3.0	Witzel (1981b)
	$\bar{x}$	24.40	29.60	31.90	34.40						
	s	1.39	1.43	2.18	2.90						

Table 25. Estimated harvest in numbers of fish for the winter ice fishery on Long Point Bay, Lake Erie, 1948-1980.[a,b]

YEAR	YELLOW PERCH	RAINBOW SMELT	NORTHERN PIKE	BULLHEAD	CATFISH	WALLEYE	OTHER	TOTAL
1948) 1959								
1960	510,992	224						511,216
1961								
1962	243,981		12			67		244,060
1963	306,192							306,192
1964	36,370	45	10					36,425
1965								
1966	53,350	62						53,412
1967	9,732	1,238		52	15			11,037
1968	87,231		62					87,293
1969) 1977								
1978	120,813	5,340	271				289	126,713
1979								
1980	264,219	18,609	245				31	283,104

[a] Annual sources as per Table 26.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

Table 26. Catch per unit of effort for species harvested in the winter ice fishery of Long Point Bay, Lake Erie, 1948-1980.[a,b]

YEAR	YELLOW PERCH	RAINBOW SMELT	NORTHERN PIKE	ALL	SOURCE
1948 } 1958					
1959	2.540			2.540	Lands & Forests (1959)
1960					
1961					
1962*	5.558			5.558	Lands & Forests (1962)
1963*	4.780			4.780	Lands & Forests (1963)
1964*	3.315	0.004	0.001	3.320	Lands & Forests (1964)
1965	4.844			4.844	Lands & Forests (1965)
1966	3.811	0.004		3.815	Lands & Forests (1966)
1967	3.629	0.133		3.778	Lands & Forests (1967)
1968	4.240		0.003	4.243	Lands & Forests (1968)
1969	2.952			2.952	Lands & Forests (1969)
1970	2.203		0.004	2.206	Lands & Forests (1970)
1971	2.342		0.002	2.344	Lands & Forests (1971)
1972	4.777		0.007	4.777	Hamley et al. (in prep.)
1973	2.962		0.006	2.968	Hamley et al. (in prep.)
1974	2.398	0.001	0.017	2.416	Hamley et al. (in prep.)
1975	0.824		0.007	0.831	Hamley et al. (in prep.)
1976	1.353	0.060	0.008	1.421	Hamley et al. (in prep.)
1977	0.952		0.012	0.965	Hamley et al. (in prep.)
1978	1.282	0.061	0.003	1.351	LEFAU (1978)
1979	3.443	0.210	0.001	3.656	Hamley et al. (in prep.)
1980	5.913	0.502	0.015	6.430	LEFAU (1980)

[a] Except where year is denoted by an asterisk (*), the catch per unit of effort (CUE) is unweighted and represents the observed number of fish harvested, divided by the observed effort in angler-hours for all anglers. Given the above exception, the CUE was weighted, viz., estimated total number of fish harvested was divided by the total estimated effort.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

Table 27. Estimated effort with associated sampling information for the winter ice fishery on Long Point Bay, Lake Erie, 1948-1980.[a,b]

YEAR	SAMPLING PERIOD	NO. OF DAYS SAMPLED	NO. OF PARTIES INTERVIEWED	PERCENTAGE OF CANADIAN PARTIES OF ALL PARTIES	ESTIMATED EFFORT (angler-h)	ESTIMATED EFFORT (rod-h)
1948, 1958						
1959				81		
1960	Dec. 15-Apr. 15		777	92		14,848[c]
1961						
1962	Jan. 1-Mar. 28			79	43,912	
1963	Jan. 1-Mar. 25		898	72	64,052	13,048[c]
1964	Jan. 1-Mar. 25		700	82	10,970	4,931[c]
1965				74		
1966	Jan. - Mar.	9	488	88	14,000	4,837[c]
1967		15	387	90	6,777	4,795[c]
1968		14	840	88	45,218	6,840[c]
1969		4	247	94		
1970	Jan.-Mar.		1,540	96		
1971			1,548	94		
1972	Feb. 1-Mar. 12	51	505			
1973	Jan. 17-Mar. 3	40	284			
1974	Jan. 18-Mar. 3	37	245			
1975	Jan. 23-Feb. 16	25	109			
1976	Jan. 18-Feb. 13	52	172			
1977	Jan. 15-Feb. 21	72	104			
1978	Jan. 5-Mar. 11	75	421	95	100,293	108,890
1979	Jan. 9-Mar. 4	62	419			
1980	Jan. 19-Feb. 28	19	376	92	46,591	47,629

[a] Annual sources as per Table 26.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Represents estimated total number of anglers.

Table 28. Catch per unit of effort for species harvested in the winter ice fishery of Rondeau Bay, Lake Erie, 1948-1980.[a,b]

YEAR	YELLOW PERCH	RAINBOW SMELT	NORTHERN PIKE	ROCK BASS	BLUEGILL	CRAPPIE	ALL	SOURCE
1948 } 1961								
1962*	0.270		0.150				0.477	Lands & Forests (1962)
1963 } 1966								
1967	0.394		0.050		0.006		0.449	Lands & Forests (1967)
1968	0.900	0.200	0.030		0.040	0.310	1.480	Lands & Forests (1968)
1969	1.500			0.167			1.667	Lands & Forests (1969)
1970 } 1979								
1980	1.891	1.354	0.001		0.002	0.002		LEFAU (1980)

[a] Except where denoted by an asterisk (*), the catch per unit of effort (CUE) is unweighted and represents the observed number of fish harvested, divided by the observed effort in angler-hours for all anglers. Given the above exception, the CUE is weighted, viz., estimated total number of fish harvested is divided by the total estimated effort.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

Table 29. Estimated effort with associated sampling information for the winter ice fishery of Rondeau Bay, Lake Erie, 1948-1980.[a,b]

YEAR	SAMPLING PERIOD	NO. OF DAYS SAMPLED	NO. OF PARTIES INTERVIEWED	LENGTH OF A SAMPLING PERIOD	PERCENTAGE OF CANADIAN PARTIES OF ALL PARTIES	ESTIMATED EFFORT (angler-h)	ESTIMATED EFFORT (rod-h)
1948 } 1959							
1960	Dec. 15-Apr. 15		63		59		504[c]
1961							
1962	Jan. 1-Mar. 28				63	2,862	1,158[c]
1963 } 1966							
1967		12	96		87	1,445	427[c]
1968		12	99		97	2,516	413[c]
1969		5	5		100		
1970 } 1979							
1980	Feb. 12-Mar. 11	15	164	4-h	94	9,035	14,607

[a] Annual sources as per Table 28.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Represents estimated total number of anglers.

Table 30. Catch per unit of effort for species harvested in the winter ice fishery of western Lake Erie, 1948-1980.[a,b]

YEAR	YELLOW PERCH	RAINBOW SMELT	CRAPPIE	CARP	ALL	SOURCE
1948 } 1961						
1962[c]*	6.280				8.092	Lands & Forests (1962)
1963[c]*	4.850	0.140			5.010	Lands & Forests (1963)
1964[c]*	9.910	1.550			11.460	Lands & Forests (1964)
1965[c]	4.815	0.047			4.866	Lands & Forests (1965)
1966[c]	6.620	0.564			7.180	Lands & Forests (1966)
1967[c]	6.407	2.830			9.236	Lands & Forests (1967)
1968[c]	9.730	1.850			11.580	Lands & Forests (1968)
1969[c]	4.817	0.712			5.530	Lands & Forests (1969)
1970[c]	2.490	0.659			3.150	Lands & Forests (1970)
1971[c]	1.657		0.226	0.008	1.891	Lands & Forests (1971)
1972 } 1980						

[a] Except where year is denoted by an asterisk (*), the catch per unit of effort (CUE) is unweighted and represents the observed number of fish harvested, divided by the observed effort in angler-hours for all anglers. Given the above exception, the CUE is weighted, viz., estimated total number of fish harvested is divided by the total estimated effort.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Specific areal designation = Pigeon Bay.

Table 31. Estimated effort with associated sampling information for the winter ice fishery of western Lake Erie, 1948-1980.[a,b]

YEAR	SAMPLING PERIOD	NO. OF DAYS SAMPLED	NO. OF PARTIES INTERVIEWED	PERCENTAGE OF CANADIAN PARTIES OF ALL PARTIES	ESTIMATED EFFORT (angler-h)	ESTIMATED EFFORT (rod-h)
1948 } 1959						
1960[c]	Dec. 15-Apr. 15		244	27		5,240[d]
1961						
1962[c]	Jan. 1-Mar. 28			19	53,192	11,760[d]
1963[c]	Jan. 1-Mar. 25		712	15	105,680	15,930[d]
1964[c]	Jan. 1-Mar. 25		365	19	29,755	5,789[d]
1965[c]				17		
1966[c]	January-March	9		19	20,332	3,820[d]
1967[c]		17	212	16	3,693	5,559[d]
1968[c]		17	196	18	24,761	2,808[d]
1969		8	115	23		
1970	February 1		20	25		
1971			65	82		
1972 } 1980						

[a] Annual sources as per Table 30.

[b] Missing values indicate that either surveys were not conducted or that required data were unavailable.

[c] Specific areal designation = Pigeon Bay

[d] Represents total estimated number of anglers.

Table 32. Northern pike harvest, effort, and catch per unit of effort for spear fishermen/pike kept in the spring pike fishery of Long Point Bay, 1973-1977.[a]

YEAR	HARVEST (number)	EFFORT (angler-h)	CUE	STUDY PERIOD
1973	809	2,126	0.427	March 16-April 14
1974	2,011	2,086	0.964	March 17-April 19
1975	1,810	3,320	0.545	March 17-April 18
1976	5,596	4,463	1.253	March 18-April 14
1977	1,108	2,230	0.467	March 19-April 17

[a] After Reid (1977b).

Table 33. Areal distribution of angling effort during the April/May smelt fishery of Lake Erie, 1959.[a]

AREA	EFFORT[b] (angler-h)	PERCENT OF TOTAL
Leamington Dock	1,716	1
Point Pelee Park	128,245	62
Mersea Township	518	<1
Kent County Beaches	1,202	1
Rondeau Beach	6,710	3
Ports Stanley, Bruce	820	<1
Port Burwell Beach	936	<1
Long Point Beach	1,185	1
Turkey Point Beach	35,109	17
Normandale Beach	6,338	3
Fishers Glen Beach	2,254	1
Port Ryerse	6,268	3
Port Dover	-	-
Featherstone Point	1,355	1
Sandy Bay	953	<1
Ratheon Point	2,473	1
Sunset Bay	-	-
Port Colborne	4,980	2
Burnaby Bay	3,320	2
Niagara River	1,500	1
Total	205,882	100
Adjusted Total[c]	226,470	

[a] After Roseborough (1959).

[b] Roseborough (1959) reported effort in terms of the total number of anglers. This was converted to angler-h by multiplying the number of anglers by 3.32. Reid (1977c) found that this was the average time in hours spent by people fishing for smelt at Turkey Point and Normandale. It is assumed that anglers only made one trip.

[c] Adjusted upwards by 10% to allow for time-periods and areas not censused.

Table 34. Estimated effort and harvest by area in the smelt fishery of Lake Erie, 1959.[a]

AREA	EFFORT (number of anglers)	HARVEST (pounds)
Leamington Dock	517	62,272
Point Pelee Park	38,628	2,569,106
Mersea Township	156	8,201
Kent County Beach	362	19,336
Rondeau Beach	2,021	92,915
Ports Stanley, Bruce	247	413
Port Burwell Beach	282	176
Long Point Beach	357	72
Turkey Point Beach	10,575	167,643
Normandale Beach	1,909	33,459
Fishers Glen Beach	679	9,289
Port Ryerse	1,888	2,762
Port Dover	-	-
Featherstone Point	408	1,113
Sandy Bay	287	970
Ratheon Point	745	3,408
Sunset Bay	-	-
Port Colborne	1,500	7,378
Burnaby Bay	1,000	4,573
Niagara River	452	12,001
Total	62,013	2,995,000

[a] After Roseborough (1959).

Table 35. Smelt fishing activity at Point Pelee National Park during April, 1957-1980.

YEAR	VEHICLES (number)	PASSENGERS (number)	% U. S. RESIDENTS	SMELT ANGLERS (number)	SOURCE
1957[a]	11,732	-	-	-	Bailey (1958)
1959[b]	10,730	39,000	86	38,628	Roseborough (1959)
1960	-	-	-	44,600	Roseborough (1962)
1970[c]	15,946	55,794	36	-	Pers. comm. E. R. Knight
1971[c]	16,687	53,421	51	-	Pers. comm. E. R. Knight
1974[c]	17,312	61,212	59	35,196	Knight (1974)
1980[c]	17,089	53,303	79	-	Pers. comm. E. R. Knight

[a] April 15-30.

[b] April 13-27.

[c] April 1-30.

Table 36. Estimated length of an angler fishing trip (angler-day) in selected fisheries of Lake Erie and connecting waters, 1977-1980.

FISHERY TYPE	AREA	YEAR	ANGLER-DAY (hours)[a]
Summer-Boat	Detroit River	1978	5.6
		1979	5.7
		1980	5.5
	Western Lake Erie	1978	4.6
		1979	4.8
		1980	4.8
	Rondeau Bay	1978	5.0
		1979	4.9
		1980	4.7
	Long Point Bay	1978	4.7
		1979	4.2
		1980	3.9
	All	All	4.9
Shoreline	Lakewide	1978	4.3
Winter-Ice	Long Point Bay	1979	5.3
Smelt	Turkey Point/ Normandale	1977	3.3
All	All	All	4.6[b]

[a] In calculating the length of an angler day, the total observed effort in angler-hours was divided by the total observed number of anglers. This quotient was multiplied by a factor of two, assuming that, on the average, anglers were interviewed at the mid-point of their angling trip.

[b] Weighted mean length of an angler-day. The length of an angler-day per fishery-type was weighted for the proportion of total annual angling effort which occurred in that fishery-type.

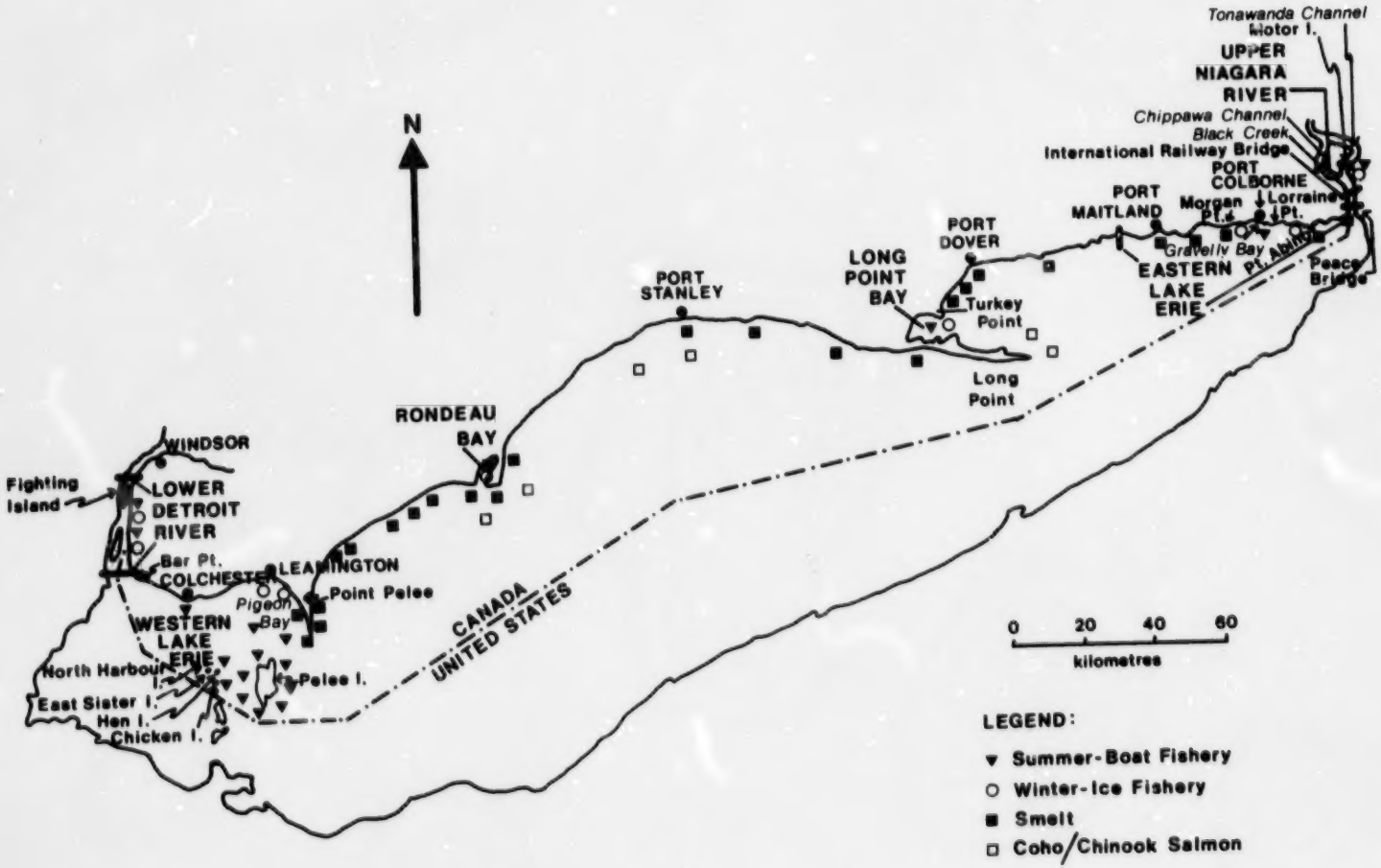

Figure 1. Principal sport fishing areas in the Canadian portion of Lake Erie and connecting waters. Individual summer-shore fishery sites are not included.

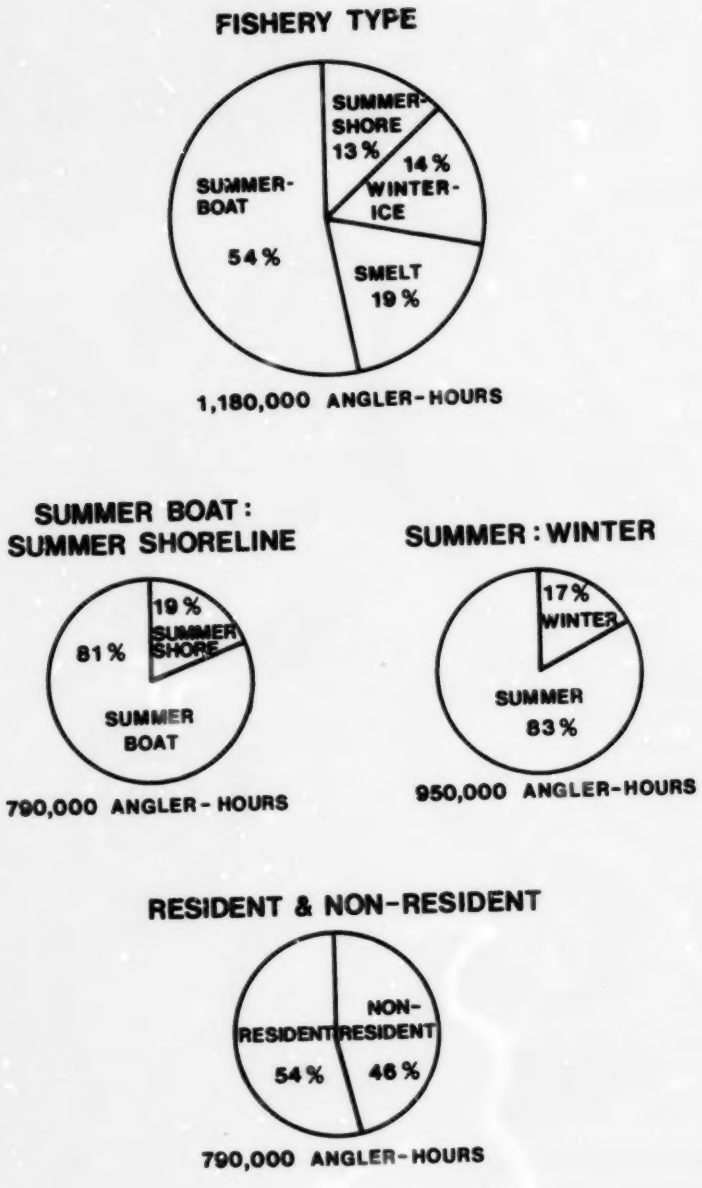

Figure 2. Distribution of annual angling effort by various classifications. Smelt effort is excluded from seasonal and residency classifications. Data derivation is defined in Tables 2, 3, 4 and 5 of Sztramko and Paine (1982).

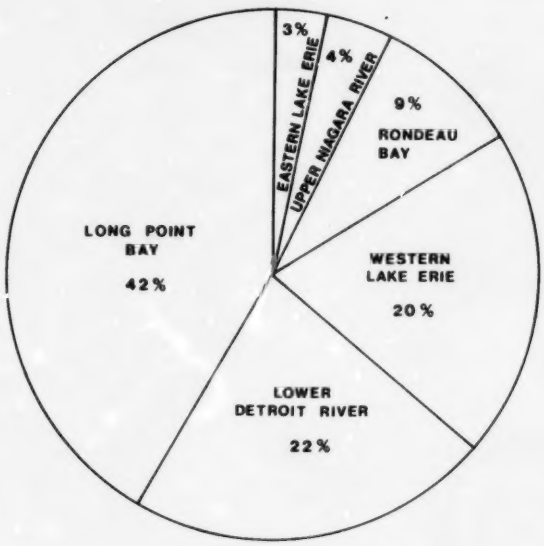

Figure 3. Distribution of annual angling effort in the summer-boat fishery by area. Data derivation is defined in Table 2 of Sztramko and Paine (1982).

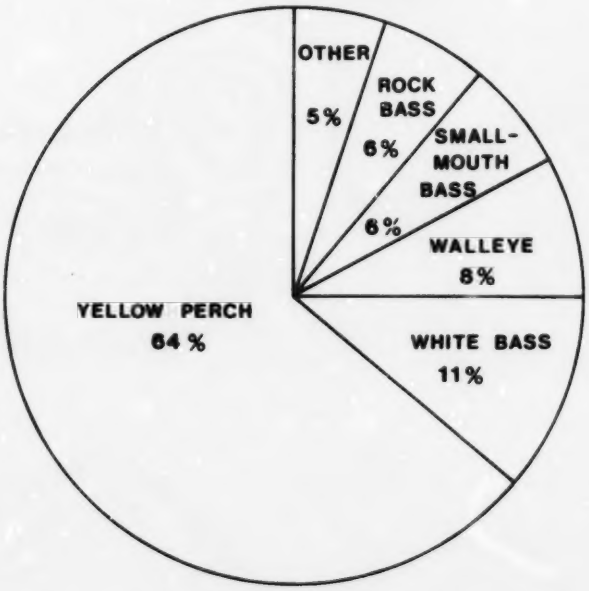

Figure 4. Annual estimated harvest in number by species. Smelt harvest is excluded. Data derivation is defined in Table 1 of Sztramko and Paine (1982).

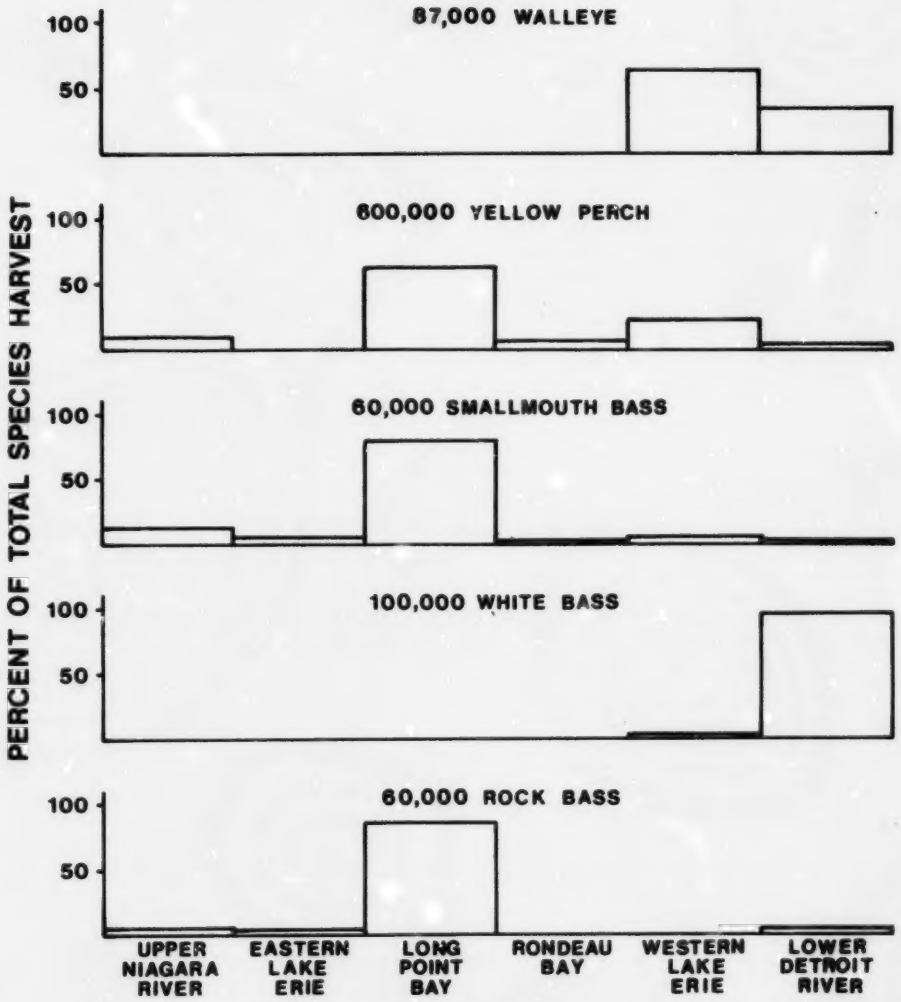

Figure 5. Total annual harvest in number by area of the major species from the summer boat fishery and the winter ice fishery. Data derivation is defined in Table 1 of Sztramko and Paine (1982).

APPENDIX

APPENDIX A. DERIVATION OF LAKEWIDE COMPARISON DATA.

To make meaningful comparisons of the relative distribution of harvest and effort among areas and jurisdictions, the most recent (post-1975) information available was used. When this was not possible, the next most recent data or, lastly, the available data were used to approximate the recent situation.

An attempt was made to relate annual angling effort exerted in the Canadian portion of Lake Erie and connecting waters to that exerted in the entire province. Total provincial fishing effort in 1980 was estimated at 34,498,353 angler-days. This was derived by adjusting the 1973-1974 value (27,537,000 angler-days by Ontario residents), as reported by Ross and Buckley (1977), upwards by 8% to allow for the increase in Ontario's population between 1973 and 1980 (personal communication M. Cruz). This value was subsequently adjusted upwards by 16% to account for the estimated effort expended by non-resident anglers. Cox and Straight (1975) determined that non-residents accounted for 14% of the total annual fishing effort expended in Ontario during 1970. During the period in question, it is assumed that the population in the U.S. increased at the same rate as in Ontario, that the ratio of resident to non-resident anglers fishing in Ontario remained constant, and that the proportion of anglers to non-anglers remained constant in both Ontario and the U.S..

To enable total annual effort (angler-hours) estimated by the LEFAU in recent years to be compared to the provincial estimate (angler-days), LEFAU estimates were divided by 4.6. This value is the weighted mean length of an angler-day in hours on Lake Erie.

In the U.S. portion of Lake Erie and connecting waters, recent estimates of total annual angling effort were not available for all states. During May through August 1980, the Michigan Department of Natural Resources conducted a direct contact creel census of the boating and shore anglers in Michigan waters of the Detroit River and Lake Erie. Total effort (excluding shore anglers, which was unavailable at the time of writing) was estimated at 920,000 angler-hours (Bryant 1981).

The Ohio Department of Natural Resources conducted a comprehensive creel census documenting total estimated annual effort from 1975 through 1977. Effort varied between 6.8 and 9.0 million angler-hours (Baker et al. 1979). At the time of writing, the New York Department of Environmental Conservation had angler data based on a mail survey (Kretser and Klatt 1976). In view of the positive bias which has been associated with mail surveys (Carline 1972), New York's estimates of total annual effort for the upper Niagara River (515,000 angler-days) and Lake Erie (660,000 angler-days) were omitted and comparisons were limited to values derived from similar surveys (direct contact creel censuses).

At the time of writing, Pennsylvania was still conducting its first Lake Erie census in recent years and results were unavailable (personal communication, R. Kenyon). Based on available information, total annual effort exerted in Canadian waters was 11.3% of total lake-wide effort; however, once effort estimates for New York and Pennsylvania are available, effort expended in Canadian waters will probably approximate 10% of the total annual effort, as per the following table:

JURSIDICTION	TOTAL ANNUAL EFFORT (million angler-h)	YEAR
Michigan	0.9	1980
Ohio	7.7	1975-76
New York	unknown	-
Pennsylvania	unknown	-
Ontario	1.1	1975-80
Total	9.7	

Ontario Fisheries Technical Report Series Guidelines
C. G. Parkes and C. I. Goddard. 1981

No. 1 Emergence and survival of lake trout (*Salvelinus namaycush*) and brook trout (*S. fontinalis*) from artificial substrates in an acid lake.
J. M. Gunn and W. Keller. 1981.

No. 2 Larval fish sampling in Lake Huron, 1978.
D. H. Loftus. 1982.

No. 3 Zooplankton in brook trout lakes of Algonquin Park, Ontario
E. Jermolajev and J. M. Fraser. 1982.

No. 4 Proceedings of the 1980 North American Eel Conference.
Ontario Ministry of Natural Resources. 1982

No. 5 The population dynamics of lake trout (*Salvelinus namaycush*) in Lake Manitou, in relation to the planting and spawn-taking operation.
B. A. Henderson. 1982.

No. 6 Survival and growth of matched plantings of lake trout (*Salvelinus namaycush*), brook trout (*Salvelinus fontinalis*), and lake x brook F_1 splake hybrids in northeastern Ontario lakes.
P. E. Ihssen, M. J. Powell and M. Miller. 1982.

No. 7 The performances of two wild and two hybrid strains of brook trout planted in an infertile, acidic lake.
J. M. Fraser. 1983.

No. 8 Decomposition of wild rice (*Zizania aquatica L.*) straw and its effect on the depletion of oxygen during winter in natural lakes of northwestern Ontario.
Pritam Sain. 1983.

No. 9 Annulus formation and growth characteristics of tagged walleye in a lightly exploited lake.
D. Baccante and J. Sandhu. 1983.

No. 10 An evaluation of climatic, morphoedaphic, and effort data as predictors of yields from Ontario sport fisheries.
D. A. Schlesinger and Alen M. McCombie. 1983.

No. 11 An annotated listing of original field data records and diaries of Ontario fisheries research laboratory workers (1921 - 1948). D. O. Evans and B. A. Campbell. 1984.

No. 12 A selective bibliography of the lake trout, *Salvelinus namaycush* (Walbaum), 1784 - 1982. C. H. Olver and N. V. Martin. 1984.

POOR

QUALITY

ORIGINAL